

COAL AGE

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Mechanization and Profits

THE EIGHTH ANNUAL National Exposition of Coal Mining Equipment, to be held at Cincinnati, Ohio, May 11-15, focuses attention on the place of the machine in the industry at a time when surface values are shifting so rapidly that reappraisal of fundamentals as a basis for future action is most essential.

IN PERIODS of easy prosperity, Topsy-like progress meets with little challenge and still less criticism. Depression, however, inspires sharp introspective examination of individuals, industries, and social and economic philosophies.

MECHANIZATION in the coal industry has been passing through a process of evolution. Passion for volume, motivated, in part at least, by the gospel of mass production which swept over American industry a few years ago, has been one factor in the introduction of the machine. Necessity for cost reductions, ever present and ever pressing, has been another. Social impulses, for the most part, have been more obscure.

WITH MARKET DEMAND at the current low-water stage, however, increased production is no longer a sound consideration. But the very conditions which have depressed the total volume make increased

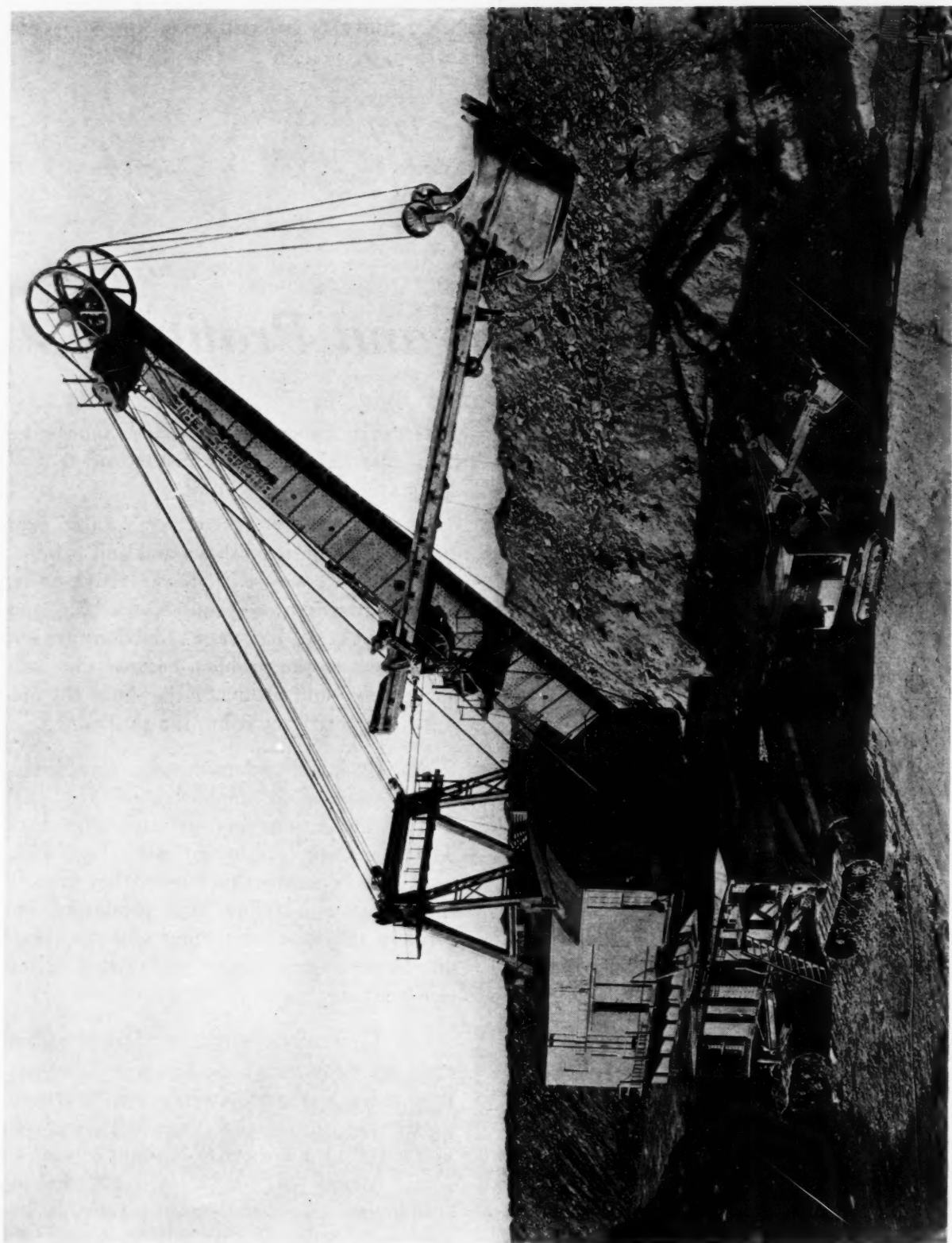
productivity more desirable and imperative than ever before in the history of the industry.

TO SURVIVE PROFITABLY, unit production costs must go down and unit productivity must go up—with fewer active units. Wage reductions, of course, will cut unit production costs, but wage reductions are not the answer to the problem because they will not increase unit productivity. Only the machine, properly employed, can do this.

UNTIL a comparatively recent date, it was popular to emphasize the fact that coal's competition was primarily internal. That situation no longer prevails. Individual coal operators may think they are still competing with fellow coal producers, but actually they are competing with gas, fuel oil, hydro-electric power and with combustion efficiency.

OTHER INDUSTRIES, faced earlier with the problem of inter-industry competition, have learned that increased unit productivity with its corresponding decreased unit costs is the answer to business at a profit when volume of output is stationary or shrinking. Coal, too, must learn this lesson, and, in learning it, will see a new significance in mechanization and a fresh urgency for its adoption.





Where Minutes Count—and Are Counted

[See page 227]

MECHANIZATION

« Promises Stabilization Of Coal Industry

EXPERIENCE changes methods and time alters views concerning the mechanization of mines. The change has not been rapid, but nevertheless it is measurable. In order that no opportunities be lost to speed up the progress of machine installation, it is well to pause periodically and gage the extent of alteration. To this end *Coal Age* has made a cross-sectional survey of mechanization as it stands today, in the completion of which executives and operating officials in three important coal-mining states were interviewed. What follows is not editorial opinion or interpretation but the experiences, viewpoints, beliefs, and suggestions of operators who produce the bulk of their tonnage mechanically.

It is held that no one factor offers a more promising influence toward stabilization of the industry than mechanization. Already that influence is being definitely felt both by operators who have mechanized their properties and by those who have not. First installed for the purpose of cost reduction as an end unto itself, the machines have since demonstrated their utility as weapons at high-wage mines to combat the destructive competition of mines which have been driving down wages and prices in their war for business. The productive economy of machines in the hands of workers who are paid the highest wage rates is dealing on close to even terms with the worst of this competition. Under market conditions less acute, this economy is yielding a margin of true profit. With wages at some mines driven to an almost irreducible minimum, it is felt that further intra-

industry adjustments are likely to do anything but drive market prices lower.

Giving evidence to profit possibilities, the president of a coal company operating two large mines said: "Mechanization gave us a profit of \$100,000 in 1930 for the first time in eight years. But one of our two mines was mechanized and our mar-

Preliminary Preparations

Over half of the mechanization problem can be solved before the first loading unit is installed. Readiness to serve is vital in such matters as electrical power supply, ventilation, and haulage. Unless these preliminary preparations are first made, the operator might better save the purchase price of loading equipment.

ket realization was lower than for the previous year." On the strength of this experience his company is now mechanizing the second property.

The increase in the annual production of machine-handled coal is not in general proportion to the number of mines being added to the list of mechanized plants. Some of the increase is coming from the gradually increasing output of those mines at which mechanization is fully established. Growth in the number of days worked is more the contributing

cause of this increase than a growth in the daily plant tonnage.

Where is this particular increment of increasing mechanized tonnage going? Is it swelling the country's annual production that much more beyond demand and thus making the market still more the buyer's? No. By and large, every ton of production gained by the mechanized mines is being transferred from the production of mines in the same market which adhere to hand loading. The blow is falling first on the hand-loading mines which pay wages comparable with, and which operate under natural conditions similar to, those found in the mechanized mines. This is because the limit of production-cost cutting, without installing machines or lowering wages, has about been reached.

Barring contingencies, operators of mechanized plants hold forth great hope for the security of their future. They see stabilizing forces arising from assurance of increasing wage incomes to individual workers in the face of decreasing payroll. Machines guarantee a constantly increasing productivity and inverse reductions in unit production costs to levels far beyond those thus far attained. Once the properties are fully equipped and proper consideration is given to amortization, depletion, and other reserves, the ultimate in capitalization has about been reached, so that financial independence will be more nearly attained. Further satisfaction is felt in the economic possibilities of regularized running time, trained workers, and more stable markets.

Not all of the operators see the strategy of mechanization in the same light. One view sees mechanization as mass production in the literal sense and suggests that the machine be made to set the pace of productivity in an aim toward higher



and higher tonnages per machine shift. A second view bases mechanized operation on a balance between the daily productive rate of the machine, the number of men on the crew, and care in face preparation. The first view is focused on the production of coal for industrial uses, while the second embraces the general market, including domestic.

Emphasis is laid on the necessity of deciding the proper set-up in relation to the available markets. Increasing machine productivity probably will be accompanied by lowering unit production cost; yet the margin between cost and realization may not be widened, because size quality has been sacrificed. A difference of 25 to 50 tons in the daily production per machine unit may give a difference of 3 to 7 per cent in minus 1½-in. screenings.

Practically all those interviewed make the admonition that preparations for mechanization be entered into cautiously. Visits to already mechanized operations which appear to offer tangible help should, of course, be made. But the results of these visits should be taken only for what they are worth; usually they come from the best side of the picture. Vital information—maintenance costs, for example—may not be made available.

One executive remarked that the attitude of the coal industry on the exchange of technical information is not healthy, and is detrimental to mechanization. There are operators who give generously of their experience, but they are the exception rather than the rule. While it is true that few coal companies keep plants closed to visiting mining men, the welcome is not always what it should be. Somewhere, somebody will hold back. There are operators who, when they come upon a "good thing," are inclined to guard their advantage

closely—some one key, if not the entire plan.

More, there has been little district- or region-wide funding of experience on those factors in mechanization which cannot be seen merely by observing operation. In consequence, each new entrant into mechanization is compelled to start nearer to scratch than would otherwise be necessary.

More than half of the mechanization problem can and should be solved before the first loading unit is installed. Unless management is prepared to provide unflinching electrical power, it might better save the expenditure for additional mining equipment. Readiness to serve is equally as important in the ventilation and haulage phases of operation.

Why better ventilation, which means also attention to complementary problems of safety? In the

Financing

Investment houses are full of idle money. Sums of that idle wealth are going out every day to ends which offer less physical security than many coal mines can offer. The burden of proof rests with the operator in orienting the credit server to a more favorable view toward coal.

speeding up of working advance, increased liberation of gas is the usual result. The more the machines, the greater the volume of dust, which certainly creates a distinct hazard in a seam of highly combustible coal. Unvitiated air in sufficient quantity will add 15 to 30, or even more minutes, to the period of productive effort of every man-shift. In this connection it cannot be too strongly emphasized that time lost involves an expense which can never be recovered.

The ventilation improvement program should be no casual undertaking. It may not involve new equipment but it does require that many tons of fallen rock in the clean-up of air-courses must be taken out of the mine. Merely to flatten falls to remove humps from rubbing surfaces, and generally to ease the course of air flow, is no sure cure of ventilation ills.

Concurrently with the making of preliminary improvements, over-all

problems of mechanization should be receiving attention. Working plans must be set up and estimates made of the capital needed and the profits expected. The study will involve the scrutiny and final rejection of a great many proposals. No estimate should be made without allowing a generous factor of safety in the margin of cost reduction. It is important that enthusiasm not be permitted to err in the wrong direction.

Boards of directors are reported uniformly hard to sell on the idea of mechanization initially. No magical arguments or plans have been devised to win the board over to ready acquiescence. Faith in the judgment of the management personnel, aided by the clearness and conservativeness of proposals, bears most weight. The success of the first installation automatically takes care of future projects. Particular attention is called to the importance of spending money wisely. As finances are a determining factor, the question is not so much what management would like to do but what it can afford to do.

Is the time propitious for mechanization of the property? Aggravations, whatever their nature, are better removed before operating conditions are changed. Those operators who have been most successful give much weight to the policy of confiding in the workers. They propose their plans to labor and make no attempt to carry them out until they have gained the favor of the majority. In this approach the disadvantages, as well as the advantages, of the new plan are revealed. No promises are made that cannot with reasonable certainty be fulfilled. A minor mistake in policy may delay the success of a plan to an extent that is far out of proportion to the initial objection.

Patience is a virtue which must be practiced in mechanization. The new methods are revolutionary to the job habits to which the miner has been long accustomed. On a contract basis, the miner was his own boss. For some time he is lost under the new conditions and, unless properly handled, may expect the company to take every bit of the responsibility for his job and his safety. It is futile to expect or to attempt a quick change-over. That results will be forthcoming eventually is borne out by the experience of several companies that have been at mechanization from three to five years. They notice a gradual reduction in the unit cost, counter to a gradual increase in maintenance, which can be credited

only to increased experience acquired by the workers.

Labor in many fields is well informed as to what the competitive conditions are which the company must meet. It is gaining a greater appreciation of market situations and what must be done to continue mine operation. This knowledge is a spur to individual efficiency and should be imparted to those who do not possess it. Where mechanization is properly established, the worker body will eliminate the drone; at least it will not fight for him. Shifting of the trouble-maker from one job to another is a practice well worth remembering. It will either cure him or cause him to quit of his own accord. That labor will respond to intelligent handling is borne out by the record of one large mechanized mine which has had no strike or discharge of an employee in two years.

Mechanization at this early stage of development has cut down labor requirements as much as 50 per cent. What to do with the surplus workers has been no easy problem. Division of labor, of course, is economically unsound. But to refuse work to men who know no other job than mining, in slack times, would bring direr consequences. Despite its attending evils, division of working time between all men on the payroll is the practice generally recommended. Better times, retirement, and shifts to other industries will eventually correct this trouble.

In the earlier days, management of mechanized mines was perplexed

by the old-man problem. The men up in years were naturally even more concerned and a situation of unrest ensued. Many companies decided to take care of the old men and, on looking back, state that this move has been of inestimable value in self-satisfaction and in morale upbuilding. They declare that less resistance is attached to the removal of ten young men than to one old man. Among other things, retention of the man past fifty has given the younger element some assurance of job security in their declining years.

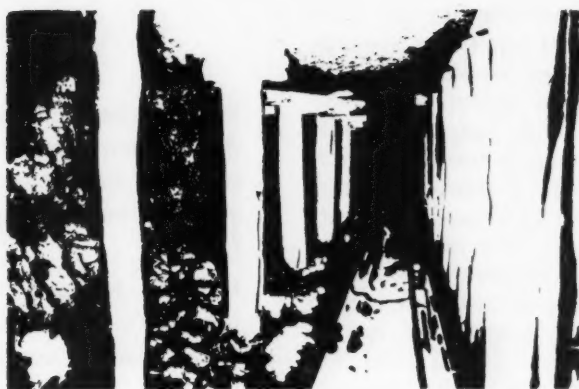
As already mentioned, visits to other plants do not give all the information necessary for final selection and adoption of machines. Under these circumstances, machine tests are suggested. Companies that have followed that policy have had their mines labeled by some as laboratories of mechanization. But the outcome of those tests has shown that they were on the right track, for by that procedure they avoided those

mistakes which so frequently are mutely evidenced on the scrap heap or in some remote crosscut.

It is said that companies with reputable credit standing should have no trouble in obtaining the cooperation of manufacturers in testing machines without making outright purchases. Naturally, the manufacturer should not be expected to foot any part of the bill. If in doubt as to the type of machine best suited to conditions, competitive tests are necessary. An equitable arrangement might be entered into by agreeing to pay the manufacturer 6 per cent interest on the selling price of the machines during the period of test; by agreeing also to cover depreciation at a rate of so much a day for the days the machines actually operate and on the basis of the expected working life of the machines; by agreeing finally to pay a blanket sum sufficient to defray the extraordinary expense assumed by the manufacturer in installing, taking out, and reconditioning the machines for resale in case they cannot be adopted.

Hand in hand with the new management set-up there must be a more comprehensive and responsive accounting system for mechanized operation. Under hand loading, the yardstick most generally used was the number of tons produced. Exact knowledge of costs was important, but not nearly as vital as to the mechanized operation. Efficiencies dropped slowly and the declines were not a burden on the plant owner alone. The worker felt the pinch as directly as did the owner. Under mechanization, rising costs may figure as a loss to the miner ultimately, but not currently. Experience has shown that high costs in mechanization cannot be reduced to a normal level in as little time as was required for the ascent. For these reasons, it is said costs in mechanization must be known in detail daily.

Operators who have been using



Stabilization

Already the stabilizing influence of machines is being felt by operators on both sides of the mechanization fence. Machines are putting mines paying high wage scales on an equal footing with operations where wages are lower and working hours longer. It is felt that wages cannot be driven beyond the lowest limit now prevailing; that for this reason the plants now mechanized will enjoy a considerable measure of profit in the future over and above their present return. Tonnage gains to mechanized mines are being transferred from hand-loading mines.

mechanized equipment for as many as five years agree that they are now less worried about obsolescence than they were at the beginning of their experience. Time has shown that loading equipment is no exception to the requirement of thorough development and testing before it is ready for general use. However, an eye must be kept on all new machines and inventions for guidance and adjustment of the depreciation and for obsolescence rate. Incidentally, the machines in service longest, when of a proved type, are frequently the best producers.

Men in the industry know that borrowed money, when properly spent in coal-mine improvements, can be made into an attractive investment. Their job is to establish that fact in financial circles. As the industry has had a succession of small-profit years, financial houses are inclined to scan the operator's record with more than customary thoroughness when asked for a loan. Yet the banker holds no brief for coal or any other branch of industry, but considers each case individually.

In a conversation not long ago the president of a sizable coal company broached the topic of mechanization. Loading machines, he said, were a wonderful help. Installed at one of his mines, they each saved the labor of forty men. Not forty, was the quiet reply of his listener. Thirty, then anyway, he added. Nor thirty, or even twenty. At this he became perplexed and, to use his words, asked, "How many, then?" He was uninformed of the fact that while machines eliminated certain jobs they created others. No doubt it is for reasons such as this that much of the difficulty has arisen.

With the situation as it is, what can be done? In the first place the operator must be frank. Cards for the hand being played should be laid on the table and rules for the new deal drawn up.

Men

Properly handled, labor will show a natural improvement in efficiency without proportionate additions to supervisory forces.

If labor is apprised of the company's problems, it will show greater desire to co-operate.

Division of working time is economically unsound, but humanism and expediency recommend adoption of this plan in slack time.

Retention of the old man is a morale upbuilder.

The banker is the only friend who can help the coal operator. For the operator not to tell the truth is to crucify himself and his fellow operators.

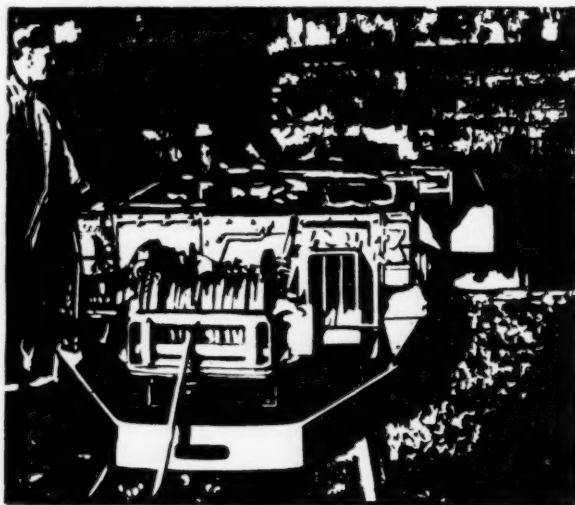
Investment houses are full of idle money. But the trustees are unwilling to invest willy-nilly, without substantial evidence of the bona fide character of the enterprise. Sums of that idle wealth are going out every day to ends which offer less physical security than many coal mines in need of help can offer.

A suggestion offered toward the initiation of mechanization financing follows: Ask for a modestly small loan—say \$20,000—for the purchase of one or two machines. Give a chattel mortgage, partly secured by col-

lateral, and agree to pay 5c. to 10c. of the saving from each ton produced. Set up a sinking fund to take care of these payments and live up to the agreement religiously. Show that business is meant by sending a check monthly toward reduction of the notes. Not until the particular equipment is better than half paid for should additional machine financing be sought.

Properly applied, loading equipment will cut the cost of production 40c. or more a ton in thick coal. What is to be done with the balance of the saving after the equipment debt is satisfied? The answer suggests a new leaf in the operation of coal mines. It involves the accountability of the operator to his investors, for whose property he is trustee. In that capacity he is duty bound to set aside increments of net receipts for interest payments on bonds, for dividends on preferred stock, for dividends on common stock if a balance remains after depreciation and depletion. He is certainly bound to take care of the last two charges, so that when the coal is all gone the original investment remains. He must, in other words, respect the true meaning of amortization. And in the division of savings, the workers must not be forgotten.

Under highly favorable conditions and in thick-seam mines a machine-shift production of 200 tons is not considered inviting. At a 250-ton stage, satisfactory performance has been attained only as applied to development work. Beyond that mark the loading machine begins to yield a return. At 300 tons the operation is getting somewhere, and at 350-400 tons real profit can be expected. There is fascination, it is said, in noting the slow but accelerating growth of the profit margin during the retirement of the first half of the investment in mechanized equipment, and the more abrupt rise of profit thereafter.



TIME STUDIES

« Increase Efficiency

At Strip Mines

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TIME is a vital element in the operation of any mining property, the importance of which increases almost directly as mechanization approaches 100 per cent. At a modern strip mine, all the principal operations are carried on by machinery, most of which operates in cycles.

The Pittsburg & Midway Coal Mining Co., which operates strip mines in Kansas, Oklahoma, Missouri, and Arkansas, finds that complete time studies of the various operations in a strip pit are indispensable to good management. In this brief *résumé* of the studies which this company has made, emphasis will be placed for comparison on two operations where conditions are quite different namely: Mine No. 10 located at Midway, Kan., 7 miles northeast of Pittsburg, Kan., and Mine No. 15, located near Mineral, Kan., 22 miles southeast of Pittsburg.

In general, the surface in the area being mined is flat and the coal dips about 22 ft. in a mile in a northwesterly direction and away from the Ozark uplift. All the coal measures mined in this area are in the Cherokee shales, the basal member of the Pennsylvanian formation, which rests unconformably upon the Mississippi limestone.

At Mine No. 10 the lower of the two coal seams is being extracted. This seam is approximately 3 ft. thick and overlaid with blue slate, occasional sandstone, drab shale, and soil. The Mineral mine is working the upper seam of coal, which is approximately 90 ft. above that worked at Mine No. 10 and is approximately 22 in. thick. This is a clean seam, overlaid with from 1 to 3 ft. of hard black carbonaceous shale, above which is blue slate, drab shale, and soil. At both mines the relatively gentle regional dip and flat topography have made it practicable to lay out the

pits* approximately parallel to the property lines, which obviously is an advantage in meeting drainage and haulage problems.

The principal difference in the methods pursued at the two mines lies in the manner of hauling and transporting coal. At Mine No. 10 (see Fig. 1), the older of the two mines, the car tracks are of narrow gauge and located in the pit, the first pit being opened near the tippie, with the operation progressing therefrom, making it necessary to maintain center openings or haulageways between the current pits and the tippie.

It has been found expedient at this mine to relay the mine track piecemeal as the shovel advances, tearing up the track ahead of the shovel which was used in the previous pit, in place of swinging the stripping shovel over a wide berm, which is the practice in Illinois and Indiana. This is done to reduce the width of the berm and to decrease the angle through which the stripping unit must be swung. We believe that this increases the efficiency of this unit to a point that offsets the cost of continually building and re-laying the track. In this case, the coal is loaded directly with a horizontal-type loader into drop-bottom cars in the pit.

At the Mineral mine (see Fig. 2) the tracks are maintained on the surface at the top of the high wall of the pit instead of at its foot. The property was opened up on the crop line and the tippie constructed back of the line of maximum digging depth, so that development work at this mine is advancing toward the tippie, and the coal on the surface is transported over the area that is later to be stripped. This system of haulage necessitates the use of a "derrick," or "bank machine," which

*The whole operation is described as a mine and each length of excavation or working face is known as a pit, the pits in this case being parallel to each other.

hoists a "skip" from the pit to the 35-ton drop-bottom cars on the surface. The following time studies give some indication of the relative merits of these two systems.

At Mine No. 10 a 750 Bucyrus-Erie shovel, having a 16-cu.yd. dipper with an 85-ft. boom and 54-ft. dipper sticks, is used; and at Mine No. 15, at Mineral, a 385 Bucyrus-Erie shovel having a 12-cu.yd. dipper with an 80-ft. boom and 54-ft. dipper sticks, is in operation. The two shovel crews are similar, consisting in each case of a "runner," a shovel engineer, one oiler, and one or two groundmen, as conditions warrant.

At both operations, in an effort to reduce the angle of swing of the stripping unit, it has been the practice to stack the first dirt from the cut in a pilot wall near the toe of the spoil pile; behind this pilot wall the overburden takes the angle of natural repose of earth. Before the shovel moves up, two or three buckets are taken on the inside of the pilot wall, giving it an angle of slope of approximately 3 to 1. The dirt placed behind the pilot wall assumes the natural angle of repose. By this method of stacking, more overburden is dropped near the shovel, which consequently can do its work with a minimum angle of swing, thereby increasing the percentage of time of the total cycle during which it is actually digging dirt from the high wall.

Each shovel is equipped with a chart (see Fig. 3) that records the swings of the shovel and clocks any loss in time that the shovel may experience throughout the stripping day. In addition to this, each shovel "runner" of the various shifts makes out a shovel report, listing the delays he has experienced that day and estimating the time lost by each delay. These reports, as well as the shovel-

swing charts, are sent into the engineering office at Pittsburg, and a stripping report, the items of which follow, is computed.

The chart is headed "Data of Stripping Shovel," Mine No. —, Type Shovel —. On horizontal lines are marked the days of the month with a line for totaling the columns. These form the first column, and the number of shifts the second. Then follow three columns on coaling, broken into time lost, number of stops, average time; three on moving up, broken into time lost, number of moves, average time; two on oiling, including total and average time; two on changing time, also including total and average time.

Other delays recorded in still other columns are: Turning shovel around, water trouble, boiler trouble, waiting for loader to pass, cleaning dipper, cleaning up slide, putting on new hoist cable, power line, electric trouble, hoist machinery, swing machinery, boom, boom machinery, ropes, cats, dipper, dipper sticks, base, propelling machinery, compressor, lubrication, generator, lights, changing shifts, moving dinky track, and trouble with shovel track. Four

Table I—Comparison of Performance of 750-B With 385-B Electric Shovel in 1930

	750-B 16-Cu.Yd. Electric Shovel Mine No. 10	385-B 12-Cu.Yd. Electric Shovel Mine No. 15	Differences in Performance
(a) Average number of possible 8-hr. shifts per month	67.1	54.4	-8.7
(b) Average time lost out of possible shifts per month, 8-hr. shifts	15.6	10.7	-4.9
(c) Percentage efficiency of shovels (figuring possible shifts) 100 (1-b÷a)	76.9	81.7	+4.8
(d) Average monthly yardage	329,300	247,300	-82,000
(e) Total yardage moved per possible 8-hr. shift; d÷a	4,900	4,480	-420
(f) Average monthly shovel advance, ft.	4,485	3,688	-797
(g) Percentage of shovel swings of 90 deg. or less	69.9	85.2	+15.3
(h) Average time of cycle, sec.	48	48	—
(i) Average total time lost per 8-hr. stripping shift, min.	78	62	-16
(j) Average monthly 8-hr. shift of actual digging (no delays)	49.5	48.7	-0.8
(k) Average monthly yardage per actual hour of digging shift	688	563	-115
(l) Average monthly yardage per actual hour dug (no delays); (d÷j)	838	635	-203
(m) Percentage efficiency of stripping shovels on shifts actually worked	80.9	85.8	+4.9

In this and succeeding tables none of the figures are carried to the number of decimal places customary in making the calculations, so that perfect agreement on checking the calculations cannot be anticipated.

columns are allowed for troubles otherwise unspecified, one for totaling time lost out of shifts dug for the one day, one for the theoretical working time and one for the percentage of working time lost.

A summary at the foot of the table gives the total number of possible 8-hour shifts, the total time lost out of 8-hour shifts dug in hours and minutes, and the percentage of efficiency of the shovel for the operations of the month under record.

These reports in general list every possible delay that the shovel encoun-

tered during the month, and they give the number of possible 8-hour shifts worked. By "possible shifts" is meant all shifts where the crew is ordered out, including Sundays, on the assumption that the Sunday repair work was necessary or the men would not have been instructed to report. Other possible shifts are those lost due to waiting on dump room, floods, and other delays due to climatic conditions. The efficiency of the shovels on these reports is calculated by a consideration of the number of possible shifts during the month and also of the actual working shifts. These reports list all the delays encountered during the month, the maximum time lost being found in moving the shovel forward, in repairs, and in motor and other electric trouble. A recapitulation of general stripping data on the shovels at Mines Nos. 10 and 15 for the year 1930 is given in Table I.

In Table I it is interesting to observe that the average monthly yardage per actual hour dug, assuming no delays, for the 16-cu.yd. bucket is 838 cu.yd., whereas for the 12-yd. bucket on the 385-B shovel it is 635 cu.yd. These are figures based on a year's operation and are in direct proportion to the capacity of the dippers, or in the ratio of 16 to 12.

Table II—Angle of Swing, 16-Yd. Stripping Shovel

Deg.	Per Cent
45 and less	20.6
45 to 60	2.1
60 to 75	12.1
75 to 90	30.1
90 to 105	15.9
105 to 120	10.4
120 to 135	3.8
	95.0

Obviously, there are many other conditions that would have disturbed this ratio. However, the fact remains that even though the angle of swing has been reduced at Mine No. 15 as compared with Mine No. 10, this record of performance is identical.

Fig. 1—Method of Stripping With Mine Cars Entering Pit

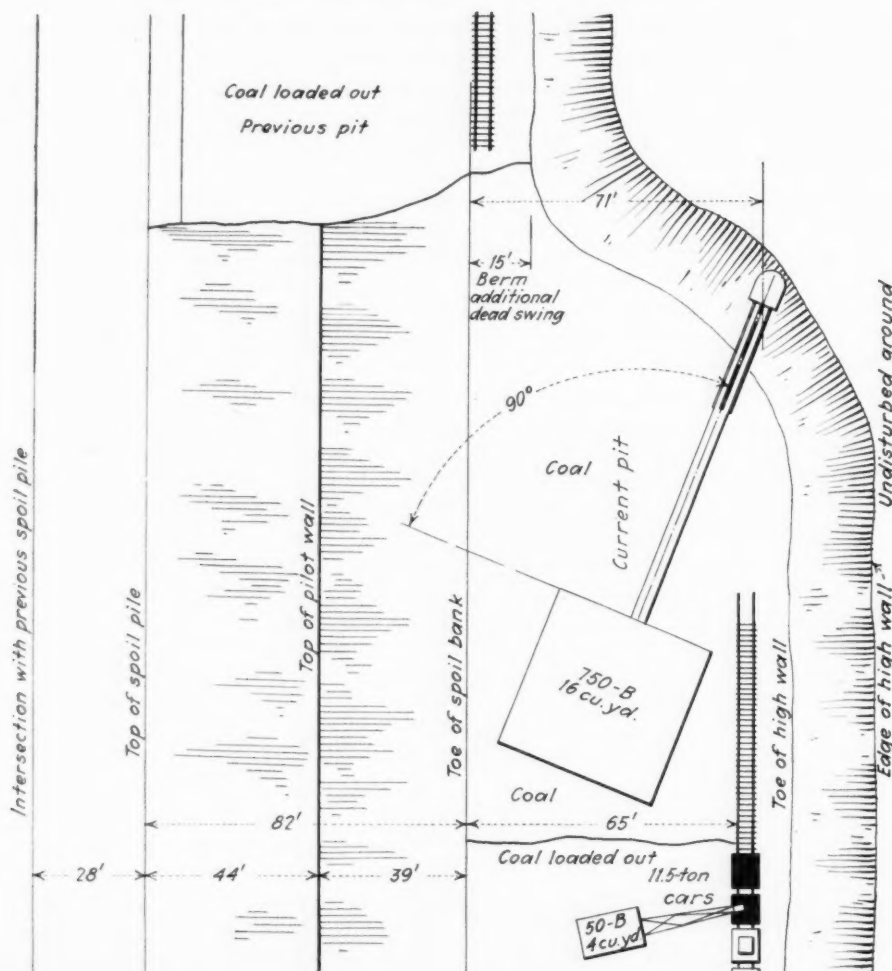


Table III—Comparison of Performance of 75-B With 50-B Shovel in 1930

	75-B 4-Cu.Yd. Electric Loader Mine No. 10	50-B 2-Cu.Yd. Electric Loader Mine No. 15	Differences in Performance
Total average monthly loading time per day, min.	441	463	+22
Total average monthly time lost per day, min.	39	17	-22
Coal loaded per actual minute of loading time, tons.	4.1	2.7	-1.4
Average number of loader swings per car.	3*	22†	+19
Average time of swing of loader, sec.	32	32	—
Average number of cars loaded per hour working time.	21.8*	5.1†	-16.7
Average time lost per move up, sec.	35	34	-1
Total average coal actually loaded per daily start, tons.	1,843	1,248	-595
Theoretical coal per daily start, tons.	1,978	1,298	-680
Loading time lost, per cent.	6.6	3.9	-2.7
Efficiency of loading shovels, per cent.	93.4	96.1	+2.7

* 11.5-ton cars. † 35-ton cars.

The nature of the hard cap rock directly above the coal at Mine No. 15 undoubtedly explains why the cycle of this unit is slower than that at Mine No. 10, where the digging is easier.

The average time per cycle on the 16-yd. machine for the year 1930 was 48 seconds. It was observed that the angle of swing during this period was as in Table II.

This same information on the 12-yd. machine shows a slightly reduced angle of swing and an average cycle of approximately 48 seconds. Obviously, the matter of completely filling the bucket, due to the difference in the nature of the overburden, is the remaining factor that has influenced these proportions, for the yardage moved by the two shovels is in direct proportion to the dipper capacity, and as the length of cycle in minutes is the same, and as the angle of swing is greater with the shovel at No. 10 mine, the digging time of that shovel must be proportionately less.

The stripping unit at mine No. 10 is followed up by a 75-B horizontal-thrust loader with a dipper capacity of 4 cu.yd. This loader is one of the largest horizontal-thrust loaders in use anywhere. At Mine No. 15, a 50-B 2½-yd. horizontal, thrust loader is used to load the coal into the "skip" of the bank machine. These loaders are of the same type, although different in size and, therefore, of different dipper capacity.

Accompanying data on the 50-B loader were taken when the loader had a 2-yd. dipper, this dipper having been recently replaced with a 2½-yd. dipper which, though made longer, is of the same width and has been made of the same depth, because the thin seam of coal being loaded would not permit of any increase. Each loader is equipped with a recording time-clock which records delays in the same manner as the charts on the stripping shovels. These loaders are operated by one man, the coal at Mine No. 10 being loaded directly into 15-ton Sanford-Day cars, on 42-in. gage track, hauled by 20-ton Vulcan steam

locomotives, whereas at Mine No. 15 the coal is loaded into the bank-machine skip of 7-ton capacity.

The bank machine used at Mine No. 15 is a 50-B Bucyrus-Erie unit, operated by one man. Coal from the bank-machine skip is elevated and dumped into 35-ton Sanford-Day automatic dump coal cars of standard track gage.

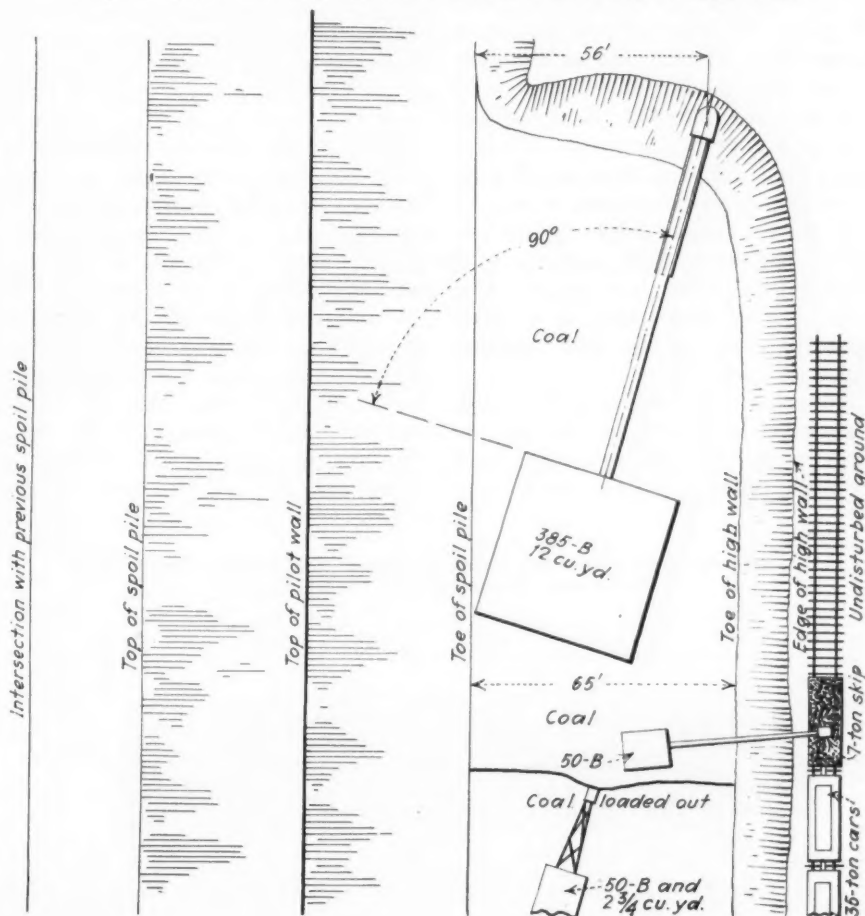
The coal at Mine No. 10 is hauled out of the pit and dumped into a 100-ton capacity hopper and elevated over the screens of a tippie of a capacity of 2,750 tons per 8-hour working day, and the coal from Mine No. 15 is hauled on the high wall, or natural ground, approximately two-fifths as far as at Mine No. 10, the coal being dumped into a 180-ton hopper and put through a tippie of a capacity of 3,500 tons per 8-hour shift.

Each loader "runner" sends in his time-clock showing where the delays occurred and what delays happened, these time charts also being sent to the office at Pittsburg, where a monthly loading data chart is computed and the efficiency of the two loaders found. All delays in loading during the day are tabulated on this loader sheet, which is entitled "Data on Loader."

Under the usual information as to mine number, type of loader, and month of record are horizontal lines representing the various days in the month. The first column is for the date of the month, the next 23 are for delays, those actually listed for record being wrecks, switching, waiting on cars, mechanical trouble, electrical trouble, changing hoist ropes, dipper latch, waiting on horseback excavator, breakdown of tippie, coaling, boiler trouble, waiting on coal shooters. Other columns give total time lost, total tons of coal lost, actual loading time, actual coal tonnage loaded, actual coal tonnage loaded per minute, theoretical loading time, theoretical coal tonnage, percentage of loading time lost, and date. The figures for the month are footed at the bottom of the line of columns.

The principal delays in loading are

Fig. 2—System of Stripping Where Cars Travel on Top of High Wall



due to loss of time in switching, to waiting on cars, and various mechanical troubles. The general average loading data on the two loaders are as in Table III.

These records show the quantity of coal actually loaded per minute by the two loading shovels, and also that the 50-B 2-yd. shovel is actually loading 32 per cent more coal than the 4-yd. shovel, when their respective sizes are taken into consideration.

The interposition of the loading and elevating of the 7-ton skip between the 50-B shovel and the railroad cars would seem likely to cause the loss of much time and slow up operations considerably, but the difficulty is less than might be anticipated because the loading of the skip takes only 1.7 minutes and the average tonnage loaded per skip is approximately 6 tons, so that 3.1 tons is loaded per minute of actual operation.

This speed is attained, in part, because the capable bank-machine operator can reduce the loss of time by lowering his skip, after dumping, to a point convenient to the bucket of the loading shovel, so that the runner of that machine can reload his skip by swinging the bucket through only a few degrees.

It is on the track that the principal loading time losses are sustained. The trips at Mine No. 15, where the 2-yd. 50-B shovel is working, are composed of three 35-ton coal cars drawn by a 25-ton Vulcan gasoline locomotive, whereas at Mine No. 10 each trip is composed of eight coal cars of an average capacity of 11½ tons. The filling of these small cars by the 75-B shovel causes a loss of much time. Thus it happens that the shovel that seems to be working at a disadvantage loads a tonnage altogether out of proportion to its size. Operating data on the bank machine are as in Table IV.

Advantages in loading with a bank machine in strip mining are that in many cases the average dead haul from the pit to the tippie can be ma-



Fig. 3—Recorder for Registering Operating Delays Used on Both Stripping and Loading Shovels; Taken From 16-Yd. Shovel

terially decreased. Also the track on the high wall need not be torn up in moving, these haulage tracks being slid over with a caterpillar tractor for a distance equal to the width of the next pit, whereas time is lost at Mine No. 10 because only a 15-ft. berm is carried on the coal and the track must necessarily be completely torn up ahead of the shovel and then rebuilt.

Table IV—Time Study of Work Of Bank Machine

Total average number of skips per 8-hour working day.....	259
Average load per skip, tons.....	5.3
Average number of skips per 35-ton capacity coal car.....	6.9
Tons of coal loaded per skip per actual working minute.....	3.1
Average time loading skip by loader, minutes.....	1.7
Average time lost daily in moving bank machine, minutes.....	18½

At Mine No. 10, where the haulage is on the coal, three trains are used to haul the coal from the coal face to the tippie, this coal being hauled through three openings, the opening used depending upon the position of the stripping shovel and the quantity of coal that has been loaded out of the pit. Some time is lost in waiting on trains, switching, cars off track, and mechanical defects in the cars. The average time lost in waiting on trains per day is 11 minutes. Some

of this loss of time may be caused by mechanical defects in the trip or by doors being down in the coal cars. The average time lost in switching is 1½ minutes. As previously stated, there is a smaller loss of time in loading at Mine No. 15 because cars of larger capacity are used and because there are fewer cars per trip, thereby causing less delay in dumping. The manner of dumping the cars into the hoppers is identical, both of the mines using the same make of car, although it requires approximately 3 minutes more to dump the eight 11½-ton coal cars than it does to dump the three 35-ton cars.

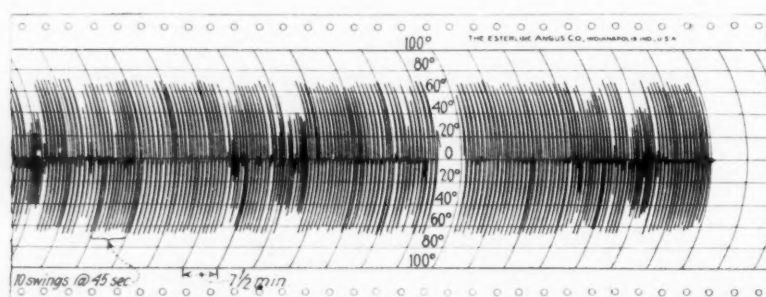
It has been my desire to give a brief *résumé* of the stripping and mining operations, and data obtained from records kept on their performance at the mines mentioned in this article. No attempt has been made to give the complete records kept on the stripping shovels and loaders, or on the time chart kept at the tippie of every mine, as this would entail too long an article. Time charts in each tippie show the daily time actually spent in loading coal, also each delay is recorded, this making a report similar to that kept on the shovels.

In addition to endeavoring to arrive at time studies of their mining equipment, each year officials compute the ratio of a man-days to tons of coal mined per day at each mine. That at Mine No. 10 for 1930 was 1:17.8, whereas at Mine No. 15 it was 1:16.4.

A chart also is kept on the life of the different makes of hoist ropes used on the stripping shovels, this chart showing the make of the hoist ropes, the date the rope was placed on the shovel and the date of replacement, the total number of cubic yards of overburden moved by each hoist rope, as well as the actual cost of the rope per one thousand cubic yards of overburden stripped.

Every effort is made to provide time studies of the different mining operations, in order to promote more efficient and more rapid loading, and to enable the different units to function properly and keep in step one with another. The tipples are capable of taking more coal than is being run over them, and if the market warrants it, production in the pits themselves can easily be increased. It is the purpose of the Pittsburgh & Midway Coal Mining Co. to have as its goal an increased mining efficiency in every department, thereby placing on the market a coal that can compete with any other.

Fig. 4—Chart Measuring Swing of Shovel and Noting Delays in Operation; Taken From 12-Cu.Yd. Shovel



MECHANIZATION ACTS

« Where Gravity Fails

By R. DAWSON HALL

Engineering Editor, *Coal Age*

ALTHOUGH natural conditions narrow the field of successful mechanization in the southern end of the anthracite region, employment of mechanical means frequently has been found to be highly profitable where natural aids to easy operation fail. This, for example, has been the experience of the Buck Run Coal Co., which some time ago introduced a longwall face in a coal seam approximately 4 ft. thick.

The face was about 90 ft. long, but was later lengthened to 150 ft. Seventy-five Lorain jacks were used in three single rows, though sometimes in two rows connected by heavy blocking. Eickhoff and Cosco shaker chutes were laid in front of the face; they delivered the coal to other shaker chutes which carried it along a heading to a crosscut, where it could be loaded into cars on the gangway.

As it formed a basin with steep sides, the coal seam had a varying inclination. The upper part of the longwall face when started was on a slope of 25 deg. The lower end was inclined only 11 deg. When the longwall face was abandoned its upper end was at an inclination of 20 deg. and the lower end at 18 deg.—the slope had become almost uniform; so uniformly steep that the shaking chutes had been removed, being replaced by galvanized sheet iron over which the coal ran without any assistance.

Though the floor rolled irregularly and so gave some trouble, it was found possible to cut the coal with the face lying straight up the dip. Jeffrey undercutters did the cutting without difficulty, but without any apparent increase, it is said, in the size of the coal obtained. In all, the face went forward 450 ft.

The operations of the longwall face, the cutting machines, the shaking chutes, and the jacks were satisfactory, and the only reason for discontinuing the work was that the coal became too thick for the jacks. Though these were 5 ft. in length, they were too short for 8 ft. coal even with blocking. So a plan that had been successful from the first had to

be discontinued and opportunities for resumption have not been found since.

Some details of conditions may be given. The floor was quite solid and the roof consisted of a falling stone or drawrock 6 to 8 ft. thick over which was a strong conglomerate; so strong that the face advanced 200 ft. before the rock failed. It should be noted that over part of that 200 ft. the opening was only 90 ft. wide and thereafter the width was only 150 ft. Consequently with a strong roof such as this the opening was not wide enough to favor collapse.

Though the longwall was abandoned, the use of shaking chutes was not, but these latter are not extended up the dip for the full length of the rooms in which they are used. They go up only so far as the inclination remains below 11 deg. Thereafter galvanized sheet iron spiked to the posts is used up to a point where the inclination is, say, 22 to 24 deg., and then the coal will run quite readily on the bottom without any sheet iron. However, in general where shaking chutes are being used (the seam being on an inclination of less than 24 deg.) the coal starts down a galvanized steel sheet till it comes to a 10-deg. slope, where it enters a shaking chute and proceeds to the car at the entry.

The bed mined is the Buck Mountain and the workings at this mine

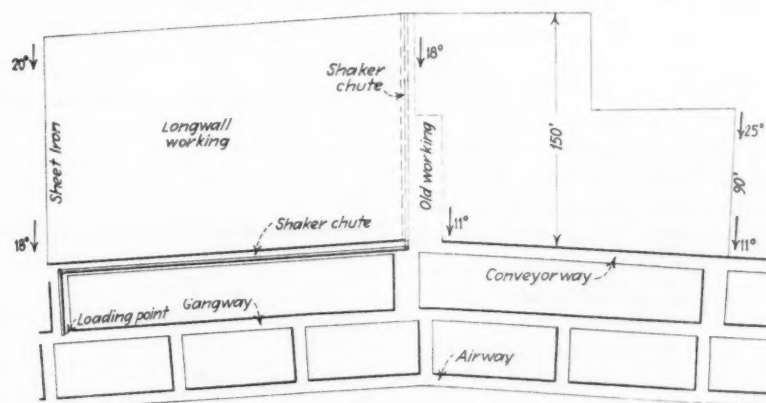
are near the end of the dip, where it begins to shape itself like the point of a somewhat blunt spoon. The roads which attempt to follow the contours make sizable representations of semi-circles.

Shaking conveyors have been used on the surface for the loading of stock coal, and here duckbills also were used. For normal loading they would have given entire satisfaction, though it is said a shaking chute will not carry as much sized coal as it will mine-run. However, the requirements usually were abnormal. An order would come in for 5,000 or 6,000 tons of nut to be delivered in a few days, so that an entire cargo could be loaded.

In order to avoid demurrage, extreme expedition was desired and that seemed best served by two steam shovels that happened to be available. Orders of this kind could not be loaded out of the mines. Indeed, a company would have to be of unusual magnitude to produce such a tonnage of one single size in the space of a few days. When such orders come they are filled by triple-shift operation with steam shovels and from stock.

At the mines of the Pine Hill Coal Co., Minersville, the conditions do not

Fig. 1—Diagrammatic Sketch of Longwall at Buck Run



favor mechanical loading, though it must be remembered that it was at this mine that the Strange scraper originated. The seam usually dips so heavily that full-battery systems are used. None of the chambers are "running chutes," so coal must be shot in order to free it from the bed. At this mine four scrapers are working on pillars which have been approached by skipping. There also are four shaking chutes, but they are only about 75 ft. long. They carry the coal from small cars or buggies to the large mine cars in the gangway.

Raven Run mine of the Hazle Brook Coal Co., near Shenandoah, has for many years been using scrapers for the loading of coal wherever the inclination of the seam is not such that the coal will slide on the bottom or on steel plates. The low headroom of scrapers is helpful not only in low coal but also in the reworking of thick seams like the Mammoth, where some of the coal has been taken and some left. If the roadway had to be driven partly through the fallen rock in order to provide sufficient height, the cost would be large if not prohibitive.

At Raven Run, only a half or three-fifths of the vertical section of the Mammoth bed was removed in earlier operations, and on reopening the old workings, scraper ways were driven in the coal left without taking rock in the bottom or disturbing the creviced or fallen rock in the top. But the scrapers are being used also in virgin coal. For this purpose chutes are driven at 120-ft. centers. They are connected by an airway, leaving a 24-ft. pillar above the gangway.

Beyond the airway, chambers were driven in groups of three, the two side chambers being symmetrically disposed on either side of a central chamber, as shown in Fig. 2. These chambers were driven of widths ranging from 16 to 24 ft., depending on the strength of the roof, with pillars ranging from 24 to 16 ft. One scraper serves for all these chambers.

Scrapers of two sizes are used, the capacity varying with the width of the scraper mouth. One size has a capacity of 15 cu.ft. and the other of 22 cu.ft. Air is compressed at the surface in a Chicago pneumatic compressor and the scraper hoists used are Lidgerwoods and Sullivans. The central room is kept in line with sights, and the two side rooms are aligned with the aid of 5-ft. crosscuts made at regular intervals.

As much of the coal at Raven Run comes from the re-mining of pillars, about 45 per cent of the output of the

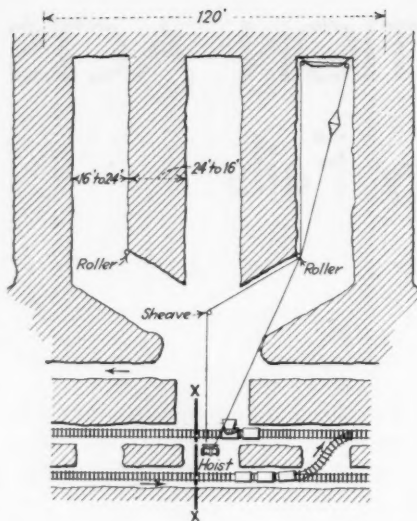


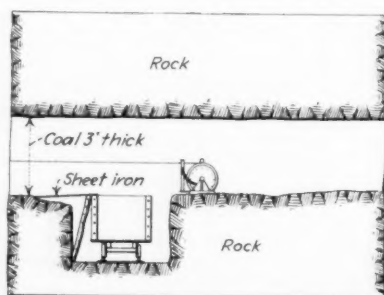
Fig. 2—At Raven Run Three Chambers Are Scrapped With a Single Hoist

mine is refuse which is removed from the coal in the breaker. The cars hold 120 cu.ft. Scrapers have been used in both splits of the Mammoth bed, approach usually being by a rock hole on a 35 deg.-pitch, 9x5 ft. in cross section, with chutes in the rock hole. In places the top coal has fallen and the workings are run in the fallen coal. In other cases the workings are on the bottom and remove the bottom coal. It has been found possible to clean up areas within a radius of 600 or 700 ft. from the rock hole.

At Salem Hill, near Pottsville, the Haddock Mining Co. is driving through the solid rock above the Buck Mountain bed, a tunnel 700 ft. long to reach two beds, one 2½ ft. and the other 5 ft. thick. The material blasted is being mucked by a Sullivan mucking hoe like that used in the Jeddo tunnel work described in detail in *Coal Age*, Vol. 35, p. 207. Three men drill the face and take about 8 hours to drill and shoot it. Then two men using the mechanical hoe load out the cut in about 5 hours, filling ten 100-cu.ft. cars. The place advances about 7 ft. per day. The tunnel costs about \$26 per yard, as against \$60 by the usual hand methods.

When this mine is ready for opera-

Fig. 3—Cross-Section of Gangway at XX



tion it will be operated by longwall, the face running straight up the dip and advancing with the strike and being cut by a longwall machine.

The advantage of the hoe scraper is that it will work downhill on a 30-deg. pitch with success. In fact this type of machine is working in three mines on that same pitch—at the Enterprise colliery of the Northumberland Mining Co., Shamokin, where the tunnel is 1,000 ft. long; at the Randolph colliery of the South Penn Coal Co., where the tunnel is 700 ft. long, and at Drifton colliery of Coxse Bros. & Co., Hazelton.

As may well be imagined, the cost of loading by hand increases greatly when working on a 30-deg. dip, but with the mechanical mucker the disadvantage of the steep dip is almost negligible. Before the machine was introduced eight men working in two shifts of four men each were needed to make a clean-up; now three men in a single shaft suffice to load a shot. It is said that the repairs will run only about 50c. per yard of advance, which is low considering the nature of the material to be loaded.

Scrapers have been used in strip-pings, especially where the coal is to be loaded into cars for haulage through the mines. Hill & Suender, contractors, are using the scrapers to load anthracite at one of the Lehigh Navigation Coal Co.'s strip-pings. It is also used for loading coal from the bank.

Recently there has been a tendency to use lighter hoists, of 7½ hp. rather than of 25 or 35 hp. The same size scraper is used, but the speed is slower. However, by keeping the slower scraper working steadily through the day it will load as much coal as the speedier scraper working, as has been customary at many anthracite mines, only a few hours per day. The lighter machine can be operated where fewer men are at work; as, for instance, where there is no sub-contracting.

Undercutting is essential with thin seams if enough coal for scraper loading is to be brought down without breaking the coal excessively fine. Where the coal is thicker than 5 ft. the need is not so obvious. A good way to shoot thin anthracite seams is to undercut the coal, put in three shots near the roof, and lay two loose shots in the undercut.

When the top three shots have been fired, the two lower shots should be exploded. These will break up the coal so that it will be in condition for loading.

Cincinnati Convention Technical Program

[Eighth Annual Convention of Practical Operating Men and National Exposition of Coal]
[Mining Equipment — Auspices Manufacturers' Division, American Mining Congress]

Monday, May 11—11 a.m.

MODERN COAL-MINE MANAGEMENT

Chairman—H. N. Taylor, Chairman of the Board of United Electric Coal Cos.

- (1) "Trends Toward Better Management," by P. C. Thomas, Vice-President, Koppers Coal Co.
- (2) "Budgeting Repair Work," by B. H. McCrackin, Maintenance Engineer, Consolidation Coal Co.

Monday, May 11—2 p.m.

SAFE OPERATING PRACTICE

Chairman—P. M. Snyder, President, C. C. B. Smokeless Coal Co.

- (1) "Maintaining Discipline," by Thomas G. Fear, General Manager of Operations, Consolidation Coal Co.
- (2) "Safety Program at Armco—Records, Methods of Enforcement, Etc.," by Charles W. Connor, Superintendent of Mines, The American Rolling Mill Co.

Tuesday, May 12—10 a.m.

MINING SYSTEMS

Chairman—Robt. J. Smith, President, Princeton Mining Co.

- (1) "Pennsylvania," by M. D. Cooper, Division General Superintendent, Hillman Coal & Coke Co.
- (2) "Illinois-Indiana District," by I. D. Marsh, Superintendent, Alcoa Ore Co.
- (3) "Mine and Preparation Plant of No. 18 Mine of Tennessee Coal, Iron & Railroad Co.," by Robt. Hamilton, Consulting Engineer, Tennessee Coal, Iron & Railroad Co.
- (4) "Far West District," by Geo. A. Schultz, General Superintendent, Liberty Fuel Co.
- (5) "Strip Mining," by George E. Nettal, General Superintendent, Pittsburg & Midway Coal Mining Co.

Tuesday, May 12—2 p.m.

MECHANICAL MINING (*Thick Seams*)

Chairman—T. T. Brewster, President and General Manager, Mt. Olive and Staunton Coal Co.

- (1) "Loading Machines," by E. J. Christy, Consulting Engineer, Wheeling Township Coal Mining Co.
- (2) "Gathering System With Mechanical Mining," by C. J. Sandoe, Vice-President, West Virginia Coal Co. of Missouri.
- (3) "Mechanized Mining at Carbon Fuel Company," by C. A. Cabell, President, Carbon Fuel Co.
- (4) "Mechanical Loading at the Little Betty Mining Co.," by P. L. Donie, Vice-President, Little Betty Mining Co.

Wednesday, May 13—10 a.m.

ANTHRACITE

Chairman—E. H. Suender, Vice-President, Madeira, Hill & Co.

- (1) "Anthracite Research for Utilization," by C. A. Connell, Acting Executive Director, Anthracite Institute.
- (2) "Results of Present Anthracite Roll Practice," by Paul Sterling, Mechanical Engineer, Lehigh Valley Coal Co.
- (3) "Preparation of Anthracite Fines," by E. P. Humphrey, Preparation Supervisor, Lehigh Navigation Coal Co.
- (4) "Speeding Up Rock Work in Anthracite Mines," by Russell L. Suender, Hill & Suender, Contracting Engineers.
- (5) "Notes on Mechanical Mining in Anthracite," by John C. Haddock, President, Haddock Mining Co.

Wednesday, May 13—2 p.m.

SAFE OPERATING PRACTICE

Chairman—C. M. Lingle, Vice-President, Buckeye Coal Co.

- (1) "Cost of Mine Accidents," by R. M. Lambie, Chief, Department of Mines of West Virginia.
- (2) "Safety and Mechanical Mining," by W. J. Jenkins, President, Consolidated Coal Co. of St. Louis.
- (3) "Safety at the Face," by F. B. Dunbar, General Superintendent, Mather Collieries.
- (4) "Safety With Conveyors," by Albert L. Hunt, General Superintendent, Pennsylvania Coal & Coke Corporation.
- (5) "Safety With Electrical Equipment," by W. P. Vance, General Superintendent, Butler Consolidated Coal Co.

Thursday, May 14—10 a.m.

MECHANICAL MINING (*Thin Seams*)

Chairman—H. L. Warner, General Manager, Kanawha & Hocking Coal & Coke Co.

- (1) "Conveyor and Scraper Mining in Thin Seams," by T. F. McCarthy, Assistant General Superintendent, Clearfield Bituminous Coal Corporation.
- (2) "Long Face Conveyor Mining at the Stonega Coke & Coal Company," by J. D. Rogers, General Manager, Stonega Coke & Coal Co.
- (3) "Successful Handling of Refuse," by F. S. Follansbee, Chief Engineer, Koppers Coal Co.

Thursday, May 14—2 p.m.

RECENT DEVELOPMENTS IN MINING PRACTICE

Chairman—C. F. Richardson, President, West Kentucky Coal Co.

- (1) "Main Line and Gathering," by Newell G. Alford, of Eavenson, Alford & Hicks.
- (2) "Cutting, Drilling and Blasting (Changes in Cutting Machines, etc.)," by G. C. McFadden, Assistant Vice-President, Peabody Coal Co.
- (3) "Treating Machine Bits," by H. H. Taylor, Jr., Franklin County Coal Co.
- (4) "Conveyor Slope Operation at Ingle Mine," by Davil Ingle, Sr., President, Ingle Coal Co.
- (5) "Economy of Creosoted Ties in Coal Mines," by D. D. Dodge, General Superintendent, W. J. Rainey, Inc.

Friday, May 15—10 a.m.

RECENT DEVELOPMENTS IN COAL CLEANING

Chairman—Erskine Ramsay, Chairman of the Board, Alabama By-Products Corporation

- (1) "Aersand Plant of Allegheny River Mining Company," by R. M. Shepherd, President, Allegheny River Mining Co.
- (2) "Washing Practice at the Nellis Mines," by E. H. Shriver, Superintendent in Charge of Special Construction, Koppers Coal Co.
- (3) "New Washing Plant of Big Vein Coal Company," by Chas. Gottschalk, Vice-President, Big Vein Coal Co.
- (4) "Coal Cleaning at Pittsburgh Terminal Coal Corporation," by Joseph Pursglove, Jr., Pittsburgh Terminal Coal Corporation.

Friday, May 15—2 p.m.

FUEL UTILIZATION

[This session under auspices Committee of Ten]

Chairman—To be selected.

- (1) "Commercial Possibilities in Beneficiation." [Speaker to be selected.]
- (2) "What the Committee of Ten Is Doing," by Oliver J. Grimes, Managing Director, Committee of Ten.
- (3) "Research on Coal for Utilization," by John R. Turner, President, West Virginia University.
- (4) "The Industrial Stoker and Its Place in the Future of the Coal Industry." [Speaker to be selected.]

LONGWALL WITH CONVEYORS

« Favored in Two-Year Trials

For New Tennessee Mine

AT PRUDEN, Tenn., the Pruden Coal & Coke Co. has opened a 3,000-acre tract of 30- to 42-in. Jellico coal and is mining it by advancing a 300-ft. face with shaker conveyors and hand loading. It is planned to equip the mine for a production of 2,000 tons per shift, but extreme caution is being exercised in every step leading to decisions as to underground methods, mining equipment, and the permanent outside plant.

Economic results to date have convinced the officials that the conveyor-longwall method in combination with steel jacks is the best available for the conditions. The company experimented with this method in 60-in. coal before trying it at the new mine. All coal that has been mined with conveyors has been charged with interest and depreciation and, in the words of the officials, "the experimenting has shown a satisfactory cost."

After visiting the Montevallo and Moffat longwall-conveyor mines, in Alabama, the Pruden officials purchased a Cosco shaker conveyor and a duckbill loader. The first work consisted of driving 525 ft. of entry through a thin streak of coal in a mine in the Mingo or Mason seam, which, in common with the Jellico seam, lies generally level. Through this area the thickness of the coal averaged about 36 in. and the thickness of the top rock taken varied

from 40 to 96 in. Next, in 60 in. of coal, a 150-ft. wall was advanced, using for roof control two rows of cribs each built of 8x8 timbers 36 in. long. When the first break was obtained after 65 ft. of advance, approximately 60 ft. of the wall was lost, but the conveyor pans had been removed in anticipation of the possibility of collapse.

Fig. 2—Method of Working Longwall and Driving Entries

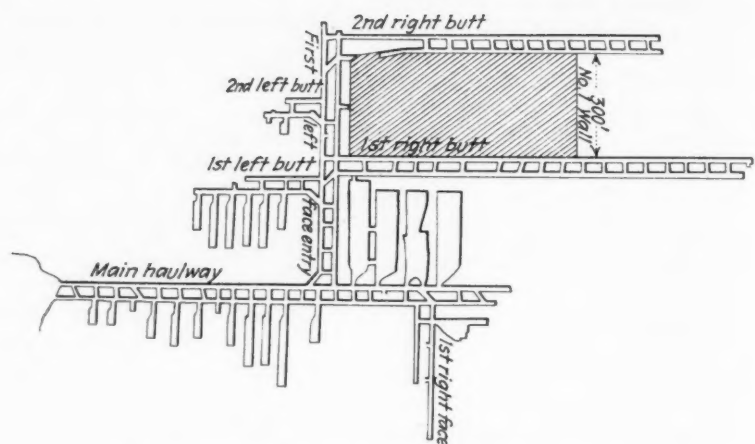
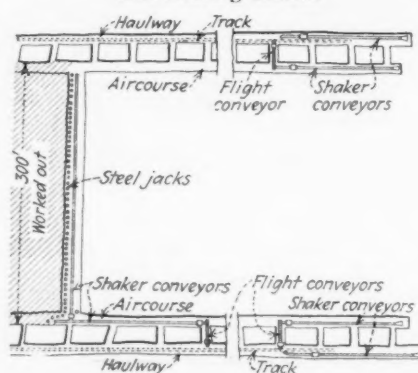


Fig. 1—Up-to-Date Map of No. 4 Mine Showing the Successful Longwall Development

After the wall was re-established, only one row of cribs was used. It was soon learned that the top could be broken regularly, but that the cost of removing cribs would be prohibitive. Steel jacks of the sand type and of the wedge type were purchased. The Langham wedge jacks were found best suited to the work and only occasionally was part of a jack lost. The first wall was advanced 250 ft., then another 150-ft. wall was started and advanced 250 ft. alongside the worked-out area of No. 1 wall.

When the shaker equipment was moved to Mine No. 4, the new operation in the 30-in. Jellico coal, several rooms were driven on the face 50 to 60 ft. wide. The top was not strong enough to allow a shortwall mining machine and conveyor to be used at the face without erecting props in between, and, moreover, slips caused considerable trouble. Next a 300-ft. wall was started and advanced on the

butts. This 90-deg. change in direction of advance eliminated the difficulties which the slips had occasioned. At this stage of their entire conveyor experience, the mine officials concluded that if the top were sufficiently strong, driving 40- to 60-ft. rooms would be the cheapest method of working. They still hold to that conclusion but, because of their specific conditions, have resigned themselves to the use of 300-ft. walls.

Fig. 1 shows the extent of workings in mine No. 4 to date. The 300-ft. longwall has been advanced close to 600 ft. and will be carried a total of 4,000 ft. to the proposed parallel second left face entry. The mine is considered non-gaseous, and, under surface ridges, the total cover will exceed 1,100 ft. Named in order, the strata immediately over the coal are: 6 to 8 in. of drawslate, 4 to 5 ft. of frail slate, 6 in. to 10 in. of coal, and a stratum of strong slate which forms a good top in haulage headings where height is required.

The plan of advancing the longwall and driving the double-heading entries at each end is shown in Fig. 2. All conveyors are of the shaker type except the short loading conveyors extending through the entry crosscuts. These flight conveyors, 35 ft. long, are Jeffrey Type 49-E. The longwall shaking conveyor is operated by the new Cosco C-20 drive, a powerful unit of extremely low type. The gate conveyor, which is located in the aircourse and forms the connecting link between the longwall conveyor and the loading conveyor,

is driven by the Cosco Type B-15 shaker engine. This latter type is used also to operate the duckbill loaders in the headings.

As the work progresses a loading conveyor is installed in the aircourse about 250 ft. ahead of the one handling the coal from the longwall. This conveyor will remain in the same position for two or three months. For a time it is used for handling the duckbill coal from the aircourse; it handles the longwall coal as soon as the wall has progressed beyond the other loading conveyor.

The duckbill shaker in the haulage heading is set close to the rib, leav-

ing room for the track and empty cars that serve the loading conveyor. The discharge end of the shaker is elevated and is fitted with a bent section so as to empty into the car spotted at the loading conveyor.

While a trip of empties is being loaded from the longwall the motor-man and brakeman are engaged in picking refuse and in trimming. As shown in Fig. 3, one man picks refuse from the elevating section of the flight conveyor and the other man from the car. The latter worker also spots the cars and starts and stops the conveyors. Spotting is done by energizing the trolley wire. The locomotive connected to the trip is left with its controller on the second or third point and the brake tightened part way. During the short time that suffices to move the trip forward and to bring another empty under the conveyor, the longwall and aircourse conveyors continue to run. Only the loading conveyor is stopped.

On the longwall, the 6 to 8 in. of drawslate is thrown back of the row of jacks and in places fills that space to the roof. This condition, of course, assists in roof control, although the roof does not come down by bending but breaks after each cut. The Langham jacks last purchased are 14 in. high. With an 18-in. spacer of semi-steel this leaves room for 2 in. or more of cap board. The jack and spacer are shown in Fig. 4.

It has been found that a considerable thickness of wood is a detriment, because its compression allows too much movement of the roof. Based on this conclusion, an effort is



Fig. 4—At the Aircourse End of the Longwall

Fig. 3—Motor Crew Picking and Trimming Longwall Coal at Loading Conveyor





Fig. 5—Duckbill Loading in Haulage Heading of Longwall Entry

being made to develop a practical steel jack the length of which can be increased or diminished several inches, allowing use of standard 2-in. boards as caps. This would save much time now consumed in selecting boards of the proper thickness to fill the space.

Eight or nine loaders usually load the 135 tons of coal on the wall in a shift of 6 to 7 hours. They are paid by the foot, and the length of wall is gaged by the number of 11-ft. conveyor pans. One man may be assigned as short a length of face as two pan lengths, whereas a more husky individual may load the length of wall opposite three pans or more. After being undercut, the coal always sits down. Only seven or eight shots are fired on the entire wall. Access by a breaker shot is all the aid a loader requires. Little wedging or barring is necessary. The coal seems to be already broken into lumps.

The night crew, which does the undercutting and the moving of the conveyor and jacks, is paid by the job. The men leave the mine as soon as the work is finished. In cases of unusual difficulty they are paid for extra time. The pans are disconnected for moving. MacHatson conveyor trough fasteners are standard equipment on the shakers. Normal support along the wall consists of one breaker row of steel jacks and one safety row.

In driving a pair of headings five men operate two duckbill loaders. One man stays at the loading point and two at each duckbill. The day shift takes three to four cuts in the coal, which means an advance of

20 to 26 ft., and the night shift takes the top to a height sufficient to provide a heading at all points over 6 ft. high. When top is taken to the strong slate above the rider coal, the height of the entry usually is 7 ft. or more. Both coal and rock are loaded with the duckbill. Fig. 5 shows the two men loading the second cut of coal under the rock in that manner.

Crosscuts are driven 60 ft. apart on the wall entries. The top is taken only in the few crosscuts where the loading conveyors are to be installed, and in these, only at the loading end. Were it not for providing short cuts through which to handle material for the longwall, auxiliary blowers would be employed and the crosscuts spaced at much greater distances. As the chain pillars are only 20 ft. wide, the coal from crosscuts is loaded by hand.

Until recently top was not taken in the aircourses (see Fig. 2). For some reason yet to be determined this top did not hold as well as that on the long face, consequently it is now being taken at the time the heading is driven in the coal. Fig. 4, looking into the conveyor space on the longwall, was taken from a point in the aircourse where top had not been taken but where it had fallen and delayed the work slightly.

As indicated by Figs. 6 and 7, it is the intention to advance adjacent walls from opposite directions. When they pass, the haulage from one of the two will be reversed in the wall entry. In Fig. 6, before the faces have passed, the coal from one wall goes out through First Left and that from the other through Second Left. In Fig. 7, after the faces have passed,

the coal from both goes out through First Left.

Officials are no longer puzzled as to the manner in which to control the roof in the longwall workings. They are now concentrating on determining the best method of entry driving and on synchronizing the various phases of the work. No final decision has been reached as to the type of loader finally to be selected for driving headings and taking the top.

S. & D. Griffith drop-bottom cars of 2-tons capacity made by the Sanford-Day Iron Works, Inc., and borrowed from another mine are being used at present, but it is the expectation to replace these with drop-bottom cars of 7 to 8 tons capacity of the same make. Ten of these cars are now being built for trial. They will be 12 ft. long and 6½ ft. wide. Turns from face entries to wall entries are being laid out on 120-ft. radii for No. 4 frogs, and 60 lb. rail is being used.

On the outside, an ingenious and inexpensive temporary hillside conveyor and tipple screening equipment is utilized to load the present mine production of 175 tons per day. Investment in a permanent outside plant will not be made until the mining methods have been finally determined and the economics proved by sufficient production experience.

Whether initial construction of the new preparation plant will include a mechanical cleaner depends on whether top cutting in the drawslate

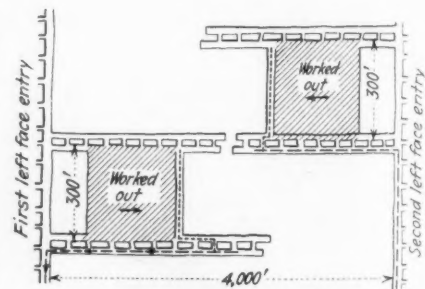


Fig. 6—Out-of-Scale Drawing Indicating Relation Before Walls Pass

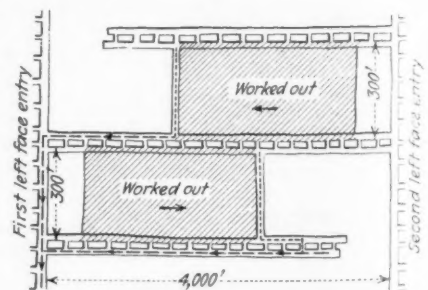


Fig. 7—Out-of-Scale Drawing Showing Reversed Haulage of One Wall After the Two Have Passed



Fig. 8—Shaker Conveyor Which Acts as Its Own Feeder; Dump and Storage Bins in Background



Fig. 9—Shaker Drive Unit Half Way Between Headhouse and Tipple

on the longwall can be substituted for bottom cutting. It is the hope that a conveyor can be attached to the top-cutting longwall machine to throw the cuttings back over the conveyor pans and between the jacks into the gob. Top cutting in the drawslate, in the opinion of the management, would eliminate need for mechanical cleaning, but even so, the tipple design would include structural provisions for conveyors to and from a cleaning plant if changed mining conditions should later demand one.

Figs. 8, 9, and 10 show the temporary outside plant. A shaker conveyor 312 ft. long set on a pitch of $13\frac{1}{2}$ deg. in favor of the load connects the headhouse and tipple. The drive, consisting of a B-15 Cosco, is located near the center of the conveyor. The conveyor acts as its own feeder from the bottom of the bin

into which the drop-bottom cars dump.

At the tipple end of the conveyor, Fig. 10, wider pans are used and in the bottoms of these are screen plates. The two decks and a refuse conveyor trough 8 in. wide above them are all driven integral with the conveyor. A lip screen is used in the top deck and pickers are stationed on each side.



Fig. 10—Shaker Screens and Refuse Conveyor Trough at Tipple Are Driven by the Conveyor

Three sizes, 2-in. nut-and-slack, 2x5 egg, and 5-in. block, are prepared. The equipment has handled 200 tons per day and screened it satisfactorily. By installing wider screens it is expected to use this conveyor for handling up to 500 tons per day. The investment is extremely low, considering that the unit includes the feeder, conveyor, and screening and picking equipments.

C. A. Griffith, vice-president and general manager, has devoted a large part of his time during the last two years to the study of improved mining methods with the view of proceeding with the fewest mistakes in opening and equipping low coal mines. R. C. Speaks, superintendent of No. 4 mine, has followed the longwall work in detail, beginning with the first experiments which were made in high coal.

EFFICIENT FOREMANSHIP

« In Practice

At Federal No. 1 Mine

AT THE last annual banquet of the Federal Mines Foremen's Club, New England Fuel & Transportation Co., the records of several section foremen of Federal No. 1 Mine, Grant Town, W. Va., were cited to indicate the possibilities for improvement in efficiency and safety by a campaign for better foremanship, a feature of which was foremanship development classes. At the end of his second year of employment one man had operated his section of the mine 424 days without an accident, as compared to 22 accidents in the ten months immediately preceding. This record, and the fact that Federal No. 1 Mine is the largest producer in the state—6,800 tons per day out of one shaft—and ranks near the top in tonnage per man for hand loading, prompted a *Coal Age* editor to spend a day observing in general the working conditions and in particular the methods employed by this section foreman.

By 6 a.m., the firebosses had completed their examinations of all working places in the mine and were assembled in the lamp house on the surface at the man shaft ready to issue electric cap lamps to the men working in the respective sections that each fireboss inspects. By 6:30 a.m., when the last man cage left the surface, each fireboss had reported to the mine foreman regarding the number of loaders checked in, and therefore at this early hour in the morning the mine foreman knew to a close figure what the tonnage and cost would be that day. The firebosses went back into the mine with the men. Their inspection shift ends at 10 a.m.

Loaders numbering 48 to 56 and about one-fourth that many company men made up the force on the section visited. Practically all were employed on a 1,700-ft. pillar line embracing twelve to thirteen blocks 90x90 ft., with four to five men working in each. The coal is 8 to 9 ft. thick and

is clean except for the two thin partings which are characteristic of the Pittsburgh seam. In headings, rooms, and pillar cuts, 12 in. or more of coal is left to support the drawslate overlying the coal.

The crew of company men comprised track layers, timbermen, drivers, pipemen, and a shotfirer. Upon arriving at the section, all men went directly to their duties, excepting the track layers and timbermen, who assembled on a bench in the section foreman's office for instructions. The foreman lost no time in opening his notebook and going over with the men the notations he had made the preceding afternoon regarding irregularities observed and places requiring preferred attention. Apparently the foreman would have had little chance of recalling all of the details from memory alone. The notebook was an indispensable tool.

About 10 minutes was taken up in this instruction to the track and timber men. Next the section foreman was engaged for 30 minutes in making out a daily report. This and a few minutes' work in posting a map constitute the total of his routine clerical work. The map posting consists of the shading in red pencil on a 100-ft.-scale blueprint the progress of coal removal from the pillars.

The section was producing 700 to 1,000 tons per day. Horses about 5 ft. 3 in. high, and weighing 1,500 to 1,600 lb. pull the cars an average of 800 ft. to side tracks, whence 10-ton locomotives, locally termed "flat

roaders," pull them to the main haulage assembly tracks. One "flat roader" handles the coal from two or three sections. The horses haul an average of 40 cars each per day.

After about 45 minutes in his office, the section foreman started on a round to visit each working place. In the third place visited he found that some dust was being stirred up by the loader. The man was made to stop and sprinkle the coal before further loading. Usually, the atmosphere in working places is practically free from dust. Water is used on the machine cutter bars and the face is sprinkled before and after each shot and the ribs are washed down as often as necessary during loading.

IN the next working place the foreman found that too much top coal was being left and instructed the loader to drill higher for the next shot. Farther along the pillar line, he noted that some track would be covered by the fall if not taken up the following day. The condition was jotted in the notebook, insuring his calling it to the attention of the track men the next morning, if not done later that day.

In a working place farther on, a safety post was found to be improperly set. The cap was set on a sloping surface of coal left hanging in the center of the place. The loader was cautioned that with such a setting the post would spring out if the top moved and, furthermore, he was ordered to pick down the projecting coal immediately and set the post properly.

In every place the cars were found to be properly blocked as specified in the printed safety rules. Props with cap-pieces were found to conform to the minimum standard requirements, but in two places the foreman ordered the setting of additional posts. He spoke a few words of greeting to every man and inquired as to how everything was going.

Frequent visits to all working places, a disposition to observe every detail, immediate correction of every dangerous condition detected, and systematic handling of all matters pertaining to the job by the liberal use of pencil and notebook, appeared as principal features in the efficient and safe handling of the section and is said to be the standard practice throughout the mine.



VOLUME vs. PROFITS

«Discounting Excess Capacity

As a Step Toward Stabilization

By RALPH N. HARRIS

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Morgantown, W. Va.*

THE bituminous coal industry has a potential productive capacity of 750,000,000 net tons per year—and the normal capacity of the market is approximately 500,000,000 net tons. In this situation, lies the real problem of the industry. Permanent stabilization depends upon:

1. Production in accord with the market capacity
2. Maintaining a fair profit on this production with
 - a. Adequate wages
 - b. Reasonable prices
3. Freedom from speculation in prices and profits.

This definition of "stabilization" includes all of the attributes of healthy industry. Really permanent stabilization can be secured upon no other basis nor can health be restored to the bituminous industry through any plan which is not so all-inclusive. A healthy industry, whatever its product may be, is one which discharges its responsibilities to capital by conserving its investment and by making an adequate return for use; to labor by assuring regular employment at wages in accord with the American standard; to the consumer by providing a regular flow of the commodity proportioned to the demand and of satisfactory and uniform quality at fair and unspeculative prices. All efforts to secure stabilization which are less fully comprehensive and which do not provide for the proper discharge of all of these responsibilities cannot be successful.

Proper coordination of these elements, therefore, is the test of successful management. Proper coordination means balanced coordination, for without balance there can be no stability. Balanced coordination must be based upon equitable distribution

of values between the various elements, and to achieve this, there must be a comprehensive understanding of the interrelationships of the elements and an unbiased viewpoint on the part of management in dealing with them. Management and capital should be no more closely allied than are management and labor or management and the consumer. Management cannot favor any one of the three in distributing the marginal value created by the exchanges between them.

In following this line of thought through to its conclusion, we are forced to accept changed ideas concerning the functions of industry and its management. Industry ceases to be exploitation for individual or personal gain and becomes a necessary service to society for which society offers a return including a marginal value which it is the responsibility of management to so equitably distribute

In these days of narrowing markets and falling prices, planning for profit must be as definite and deliberate as planning for production. While alert industry is seeking to develop new uses for its products, it must also work out the more immediate problem of profitable sales in existing diminishing markets. This, as Mr. Harris points out in the present article, calls for a frank facing of facts which may not be palatable but which will surely grow increasingly bitter and dangerous if they are ignored.

that a balance is maintained. Unlimited profit ceases to be a legitimate, or even a desirable, goal for industry, since ultimately it will create a lack of balance and instability which will destroy it. Successful management must control and limit profits just as it must control and limit wages and other costs and sales prices—and for exactly the same reasons.

Stabilization programs dependent entirely upon group action for their effect will not long survive. To obtain majority acceptance, they must contain compromises which constitute inherent weaknesses in the plan due to the failure to cut to and remove the roots of the trouble. Factitious conditions of improvement may be thus created, but they can be supported only by group action, and even then only temporarily. If the ideas and methods advocated are fundamentally sound, they will create benefits for the individual unit of the industry when adopted by it, whether other units do likewise or not, although, it is true, the results obtained may be greatly improved and the beneficial reactions greatly strengthened by majority acceptance.

If ideas are presented the acceptance of which may be demonstrated as being profitable for the individual unit, they may find acceptance among a sufficient number to create an influencing nucleus around which trade-wide thought and action may be centered. If such ideas are found to be fundamentally sound, this concentration of thought may lead to stabilization or, at least, be a step in the right

direction and ultimately lead to the desired goal, for "a journey of a thousand miles begins with the first step."

As the course followed by American industry during the period of its greatest growth is retraced, two outstanding landmarks marking changes in the policies of management as clearer conceptions of the ultimate goal were secured appear. The first was reached about ten years ago when the viewpoint of management was shifted from the direction of volume of output to productivity, or amount of product, per unit of working time. The second is just now being reached and will mark another change of direction—from unlimited profits as the final goal of industrial enterprise to controlled profits for the sake of stabilization and permanence.

Management was more or less prepared for the first change in objective as it had passed through periods of machine-effectiveness and man-effectiveness. The last decade marks its transition through two other periods which were natural advances in its progress—periods of production-effectiveness and distribution-effectiveness. The rate of approach to and acceptance of the conditions imposed by the period next ahead will depend very largely upon the attitude of capital, as this will be the period of capital-effectiveness during which each dollar of capital, especially of credit capital, will be worked for general acceptance of the idea that the wages of capital must be controlled just as are the wages of labor and that idle capital is no more entitled to wages than is idle labor.

THE influences that caused the first shift in viewpoint by industry as a whole from volume to productivity are identical with those experienced by the bituminous industry; namely, a slackening of demand with a narrowing profit margin due to lowering prices. Until that time, the demand upon management was for greater volume, with cost a secondary consideration. With the change in conditions, there was still the urge to maintain the profit line, but this could no longer be done by increasing volume. The market was contracting rather than expanding. Management turned from *volume* of production to *cost* of production, and maintained its profit by increasing the effectiveness of every component part of its outgo dollar. Bituminous management is still crowding for tonnage; it is in this failure to change its viewpoint



Ralph N. Harris

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that the management of this industry is most dangerously out of step.

Because of this lapse, it has failed to maintain its profit and has vainly lowered the wage scale until it is a disgrace to the industry. It has created another situation which is dangerous and false: the speculative middlemen's market in which the operator has lost his individual identity, is supporting an unnecessary zone of competition, and has permitted the functions of distribution and price-making to pass beyond his control. If the bituminous operator will shift his objective from tonnage to productivity, in the fullest meaning of the word, he will immediately be in a position to help himself. If he does not do this, neither government intervention nor the aid of any other agency will be able to provide relief.

If the statements of the last two paragraphs are correct and the analysis of the present viewpoint of bituminous management is accurate, the bituminous industry is ten years behind the position now occupied by the management of industry in general, and this is the gap which the thinking of the bituminous operator must cover quickly. He must promptly accept the progress made in management ideas through the periods of

production- and distribution-effectiveness and take his rightful place in the vanguard as a modern and intelligent controller of one of the nation's largest basic industries.

To change the viewpoint of so large a group is a sizable undertaking and will be accomplished only as the operators themselves recognize the necessity, honestly desire to change the conditions under which they are working, and become willing to accept the experiences of others in working out satisfactory solutions to similar situations.

THE change of viewpoint by management in general was not a sudden about-face but a gradual development extending over a period of approximately eighteen years during which time the methods of (1) production control, (2) personnel management and (3) cost control had been devised, tested and adapted to various types of organizations in practically all branches of industry. It is in the methods of the third group that the bituminous industry will find the greatest benefit and the most prompt relief. "Cost control," or "budgeting," is more than cost accounting, which is purely historical and possesses none of the attributes of control. Cost control predetermines costs as to what they should be based upon—a carefully designed plan of proper operating conditions from an engineering standpoint—and does not merely record what costs have been from an accounting standpoint.¹

Until the débâcle of 1929, progressive industry as a whole was able to maintain an income sufficiently high to include profit, in spite of weakening demand and declining prices, through the complete control of expenditures and the partial control of income and profits. The control of income and profits exercised by management is referred to as partial because of the fact that they were not

¹"The giving up of the historical attitude toward costs in favor of the more dynamic and practical point of view had its beginning about 1915-1917. In the latter year, G. Carter Harrison published his first paper on predetermined or standard costs. His point of view was scientific, or the same as that of the engineer. Costs were not mere past events to be discovered and recorded. Rather they were operating results in the making, to be predetermined and controlled for the benefit of the manufacturer through the method of variation analysis. Associated with this cost-accounting development both in time and approach was the predetermining and control of income, expenditures, and profits by means of the budget—another management method. The idea of budgeting is inherent in predetermined or standard costs. In fact, standard costs may be quite properly referred to as budgeted costs."—L. P. Alford, *Laws of Management* (Ronald Press, 1928).

limited—commodity prices did not decline with decreasing costs, as they should have done to preserve the balance of distribution between the consumer and capital and labor.

If the bituminous operator will honestly strive for the complete control of his income, expenditures, and profits, he may hope to improve his ability to survive existing conditions, and to the extent to which such adequate control is adopted by the industry so will stabilization be approached. But he must be willing to face facts and govern his actions in accordance with his findings.

Perhaps the most difficult change in attitude will be in regard to the control of profit. It is no longer possible to consider profit as an unlimited amount which is the special property of capital and which may be enlarged at the option of capital at the expense of the consumer by increasing sales prices—through monopoly, perhaps, or at the expense of labor by decreasing wages.

PROFIT is the reward offered by society to industry for service in furnishing to it commodities which it needs or desires.² Society does not consider the production of a commodity which it cannot use as service, and withholds its reward. A corollary of this statement is that industry, except for an allowable factor of safety, cannot base its profit requirements upon an amount of invested capital larger than that required to satisfy properly the demands of society for its commodity. The bituminous industry has a potential annual productive capacity approximately 250,000,000 tons beyond the needs of the market. The attempt to use this capacity has resulted in annual losses which in 1928 amounted to \$20,000,000. So long as this attempt continues, no profit will be obtained, for so long as the market cannot absorb 750,000,000 net tons; the surplus between that tonnage and the actual needs of society has no value. The industry has been blindly following the idea that sales income

could be increased by increasing production and that as sales income increased, with costs remaining level, there would be created a spread between costs and income which would be profit. The fallacy of this idea has certainly been demonstrated to the complete satisfaction of everyone.

Recognizing this fact, why does the industry continue this policy? Because it has been capitalized upon the basis of a capacity of 750,000,000 tons, has received credit upon this basis, and feels a demand to realize upon this basis. The statement given as a corollary in the preceding paragraph must be applied. Society does not permit an industry to obtain a profit upon the basis of capital invested but only upon the amount of capital investment necessary to serve it properly. The bituminous industry



must become a 500,000,000-ton industry and must learn to make its profit upon that tonnage.

This is the major readjustment which the industry must make.

Whether or not the industry comes

²Annual output in excess of 200,000 tons.

³The actual increase in the number of mines grouped with Class 1 was 40.5 per cent, but this was due, in part at least, to the post-war collapse and to the winter strike which reduced the output of a large number of individual mines; in 1919, only 550 mines were in Class 1; in 1928, there were 773 mines so classified. A more significant comparison, perhaps, is in the number of Class 1 mines reported in 1920, a year of unusual activity from the standpoint of total tonnage produced by the bituminous mines of the country, and in 1929 when the total output (535,000,000 net tons) was 34,000,000 tons less; in 1920, there were 701 Class 1 mines and they produced 42.1 per cent of the total output; in 1929, there were 827 Class 1 mines and their production was 65.2 per cent of the total output.

⁴For the study of the shrinkage in the number of producing companies between 1920 and 1929, see article by Tryon, Metcalf, and Rogers in February *Coal Age*; Vol. 36, p. 79.

to the 500,000,000-ton basis is not altogether a matter of choice. Certain influences are at work which will bring about this reduction. From 1919 to 1928, the total number of commercial mines was reduced 28.3 per cent while the number of Class 1 mines³ increased substantially,⁴ and the output of this group in proportion to the total tonnage of the industry rose from 37.6 in 1919 to 60.7 per cent in 1928.⁵ Here is shown a concentration which together with the well known consolidation of both developed and undeveloped acreage is bound to have a stabilizing influence.

This concentration, together with the fact that periodically higher prices may not be expected, will result in the subsidence of the average price level to a point prohibitive to the average operator as he is now functioning. This means the forced liquidation of the high-cost and unsoundly managed operations whether it is desired or not. This trend cannot be stopped nor should it be; any attempt to create factitious protection for these operations is bound to fail. It is possible, however, to lessen the effect of this trend by increasing the number of operations which will be able to escape forced liquidation and whose existence is justified by low costs and sound management. This can be done only by voluntary adjustment of the industry to the capacity base imposed by the requirements of the market.

IT will be far better for the individual operation to face the facts voluntarily and, of its own accord, wipe off its records the capital investments which are represented by idle or worthless plant and equipment than to hope foolishly for the restoration of such conditions as will make possible the securing of a profit upon such a basis. This voluntary liquidation of useless investment—useless because it can be used only to produce something which has no value to society—will greatly aid the maintenance of the total capital investment of the industry by increasing the number of operations which will survive involuntary liquidation. A voluntary depreciation in investment of 30 per cent is certainly more to be desired than an involuntary depreciation of investment to the amount of 90 per cent.

[The second article in this series by Mr. Harris will take up the breakdown and analysis of the mining-industry dollar as the first step in profit engineering.]

²"Profit, in its real meaning is a service charge. It is the increment over investment, which buyers are willing to pay for development and knowledge and willingness to serve in giving others the benefits of skill and effort so that the needs and wants of mankind may be supplied. It follows, then, that the greater the service, the greater should be the profit. Losses will not be mentioned, for, considering the demands of the race which must be supplied by industry—and this is rendering service—there should, theoretically, be no losses, for to sustain them would clearly indicate violations of economic law."—C. E. Knoepfel, *Factory and Industrial Management* (February, 1930).

TIMBERING COSTS

« Show Wide Variation

PERHAPS no other item of mine cost varies so widely when comparing different districts as does the timbering. The range appears to be between 1c. and 50c. per ton. Roof conditions, methods of mining, thickness of bed, local cost of lumber, and labor rates all make a tremendous difference. During 1929 a mine in the Pennsylvania anthracite region had a timbering cost of 50c., and during the same year one of the large operating companies in that field had an average timbering cost of 22.8c. for material only, including propping timber, ties, sprags, and so on.

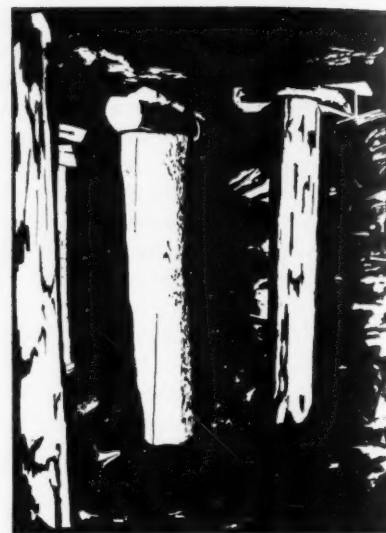
During 1926 and 1927 three representative mines in Iowa had timbering costs of 6, 8.3, and 8.7c. This included material only for ties and props. In that district timber is relatively scarce and the mine top exceedingly frail. In the particular mines reporting these costs the method of mining is to drive rooms and abandon pillars.

R. H. Morris, general manager, Gauley Mountain Coal Co., Ansted, W. Va., supplied the accompanying table setting forth details of all lumber and mine timber which the company used over a period of five years. Labor is not included in these data. The average cost for mine timber only, not including ties, was 2.86c.

per ton for the Ansted division, and 4.84c. per ton for the Jodie division. The former mine is in the No. 2 Gas seam, 42 in. average thickness, and the latter is in the Winifrede seam, where the height averages about 48 in. Most of the timber was cut on the company property but the resulting cost was very little below the quoted commercial price in that vicinity.

At a group of mines in the Kanawha field of West Virginia operating in the No. 2 gas seam where it averages 54 in. in thickness, the board feet per ton of coal mined for five years ran as follows: 1923, 3.89c.; 1924, 5.37c.; 1925, 5.52c.; 1926, 5.3c.; and 1927, 4.68c. At another mine in the same seam but in the Coal River district, the mine timber cost during 1929 was 6.9c. per ton. Here the coal averages 42 in. in thickness and the top is a frail slate.

At a mine in the Eagle seam in Logan County, West Virginia, where the top over most of the mine is a drawslate and the coal thickness somewhat over 60 in., the timbering cost approximates 7c. per ton. In the Greenbrier field, mines in Sewell coal in thicknesses from 4½ to 8 ft. have timbering costs from 2c. to 3.4c. per ton. At a mine in the Pocahontas No. 3 seam near Beckley, W. Va., where the coal is 48 in. high and the



top quite favorable, the cost of timber amounts to 3c. per ton. At still another West Virginia mine, this one a large operation in the northern part of the state in the Pittsburgh seam, the timbering cost is but 1½c. per ton. The working height is approximately 7 ft. and over a foot of top coal is left even in the rooms. Pillars are extracted on the block system.

In Alabama, the 1927 cost for mine timber in 42-in. coal worked room-and-pillar at a certain mine was 3.3c. per ton. Later the mine was changed to longwall and the timber cost jumped to 6c. In the same state, another mine in 30- to 42-in. coal that is worked longwall has a timber cost of 11c. per ton.

In none of the instances cited had treated timber been used long enough or to sufficient extent to influence costs. In several of the mines of the above list steel headers are used with wood posts. This steel is included in the timber cost. In those instances where the mining was by longwall, steel jacks were not used.

Recapitulation of All Lumber and Timber Used By Gauley Mountain Coal Co.
(Total for years 1926-7-8-9 and for 11 months of 1930)

	Jodie Division (Coal produced, 580,283 tons)			Ansted Division (Coal produced, 1,270,704 tons)			Both Divisions (Coal produced, 1,850,988 tons)		
	Board- Feet	Price Dollars	Total Dollars	Board- Feet	Price Dollars	Total Dollars	Board- Feet	Price Dollars	Total Dollars
Mine timber.....	2,007,189	14.00	28,100.64	2,616,251	14.00	36,627.51	4,623,440	14.00	64,728.15
Mine ties.....	198,136	26.00	5,160.90	495,491	26.40	13,081.70	693,627	26.30	18,242.66
Mine car lumber.....	10,630	37.62	399.87	128,100	34.60	4,432.49	138,730	34.83	4,832.36
Frame lumber.....	167,484	31.00	5,175.65	167,451	27.68	4,636.71	334,935	29.30	9,812.36
No. 3 oak lumber.....	57,431	24.14	1,386.18	224,329	21.55	4,833.22	281,760	22.07	6,219.40
Fencing lumber.....	3,637	38.66	140.62				3,637	38.66	140.62
Tipple lumber.....	63,981	47.27	3,024.83	84,970	36.60	3,109.84	148,951	41.19	6,134.67
Pine flooring.....	13,584	50.00	679.20	23,036	52.71	1,214.24	36,620	51.71	1,893.44
Ceiling.....				6,370	35.51	226.23	6,370	35.51	226.23
Mine rail.....	729	35.00	25.51	530,733	24.20	12,845.47	531,462	24.22	12,870.99
Coke door lumber.....				246,270	10.00	2,457.60	246,270	10.00	2,457.60
Totals.....	2,522,801		44,093.46	4,523,001		83,465.01	7,045,802		127,558.47
Average price.....		17.78			18.45			18.10	
Board-feet per ton coal mined.....		4.35			3.55			3.81	
Cost per ton coal mined.....		7.6 cents			6.57 cents			6.89 cents	
Mine timber only, cost per ton mined.....		4.84 cents			2.86 cents			3.49 cents	

SAVING LIVES AND LIMBS

« By Systematic Planning

By G. N. McLELLAN

*Safety Engineer
Butler Consolidated Coal Co.
Wildwood, Pa.*

WILDWOOD, the new mine of the Butler Consolidated Coal Co., located in Allegheny County, Pennsylvania, 15 miles north of Pittsburgh, is the first coal mine in America to be designed for 100-per cent mechanical operation. In the design of such a plant many problems confronted those investing their capital, but safety was made the first consideration. It was evident that a project of this kind would take a large investment, in safeguarding which not only the property would be conserved but, also, and above all, the lives of the employees. Not only was the equipment installed made to comply with the laws and regulations of the State of Pennsylvania but care was taken to exceed these wherever it seemed that greater safety could thus be attained.

In the projection and development of the mine workings, much consideration was given to the problem as to the manner in which every electrically operated underground unit that would or might leave the main-line haulage would be assured of continuing in a well-ventilated area. The mine is ventilated by a 7x11-ft. primary exhaust, reversible fan, which is designed to deliver 300,000 cu.ft. of air per minute against a water gage of 3 in. at a speed of 140 r.p.m. In the control of these operations safety in general, and ventilation in particular, constitute a force greater than desire for tonnage or low production cost.

A year ago, when I accepted the position as safety engineer at Wildwood, I was much impressed with the interest that was manifested by the president of the company and his associates in the safety movement. All the officials of the company realize that accident prevention work is not a thing apart in itself, but rather an essential and integral part

of economical production. In the past year the organized accident prevention work has resulted in increased efficiency, economy in operation, improved employee relations, and a large decrease in the number of lost-time accidents.

In starting a systematized accident campaign, the first move was the physical examination of prospective employees. In a mine such as Wildwood it was necessary to employ men who were not only intelligent but also physically fitted for the work they were to perform. The principal reasons established for the rejection of employees were: (1) Defective eyesight, (2) hernia, (3) heart defects, (4) high blood pressure, (5) venereal disease, (6) deformed or missing members, (7) tuberculosis, (8) defective hearing.

As a result of the physical examination of employees a large number of men with cases of hernia have been refused employment, thus saving much compensation, loss of time, and loss of production.

Though the management was "sold" on organized safety work, it was necessary to sell the safety idea to the foremen, and then for the foremen to sell it to the men. The foreman is a representative of the safety department in the shop and on the section and acts in the capacity of a safety director over his particular group. The safety of the men working for a foreman usually is in proportion to his ability to interpret the management's sincerity to them correctly, for what the workman thinks of the foreman he also thinks of his company. If the foreman is just or unjust, friendly or unfriendly, interested in safety or indifferent to it, the workman concludes that the company is imbued with the same

spirit. The workman is no more interested in safety than he believes his foreman to be.

Employees today are keenly interested in having an orderly place in which to work, modern machinery, and a foreman who is not only friendly but looks out for their interest and gives them a square deal. It is our policy to try to lead our men by practicing fellowship at all times, for we have found that most men are splendid fellows when we know and understand them. Our foremen have been instructed to keep in close touch with their men, think with them and work with them, be always ready to give counsel and advice, but be slow to criticize and to see that the men are satisfied, for usually a satisfied workman makes for safety.

In April of last year the Bureau of Mines' car visited Wildwood and gave mine-rescue and first-aid training. Through this medium was laid the foundation for safety training and educational work among the employees. During the four-week period in which these classes were conducted, 97 per cent of the men qualified and received Bureau of Mines certificates. Two weeks was taken in training the key men, all of whom were foremen. It was the duty of each foreman to train the twenty or less men who worked under him. During the course of training twenty of our men were trained also in the principles of mine rescue and recovery operations consequent on mine fires and explosions.

To maintain enthusiasm in safety work, the Bureau of Mines, on request, organized a branch of the Holmes Safety Association from among the mine personnel. Programs

BUTLER CONSOLIDATED COAL COMPANY

Wildwood Mine

Investigation Report

On Fatal or Lost Time Personal Injury

Name of Injured Person Reference No.
Date of Injury Time Case No.

1. Parts of Body Affected
2. Description of Injury
3. Present Condition of Patient
4. Fill Out Lines Necessary to Describe Character of Injury, and Number in Sequence of Relative Importance.
 - A. Asphyxiation by
 - B. Bone Broken by
 - C. Bruised by
 - D. Burned by
 - E. Crushed by
 - F. Cut or Pierced by
 - G. Dislocation Due to
 - H. Eye Injured by
 - I. Rupture Caused by
 - J. Frozen While
 - K. Heat Prostration While
 - L. Infection of
 - M. Electric Shock From Contact With Voltage of Circuit
 - N. Sprain or Strain Due to
 - O. Poisoned by
 - P.
5. When Was Injured Party Last Examined Physically Before Being Injured?
6. What Organic Troubles Did Examination Show?
7. Number in Sequence of Relative Importance, All Words or Phrases Below Which Describe Cause of Accident

- | | |
|---|---|
| A-1—Employees Not Instructed at All. | H-2—Danger Points Not Guarded. |
| A-2—Instructions Not Enforced. | I-1—Material Improperly Piled, Loaded or Stored. |
| A-3—Instructions Incomplete. | I-2—Untidy or Otherwise Dangerous Passages or Work Spaces. |
| A-4—Instructions Erroneous. | I-3—Clearance Insufficient for Safe Work. |
| B-1—Employee Inexperienced. | J-1—Defective Materials. |
| B-2—Employee Not Skillful. | J-2—Defective Tools, Scaffolding or Tackle. |
| B-3—Employee Ignorant. | J-3—Defective Machines. |
| B-4—Employee Used Poor Judgment. | K-1—Defective Insulations. |
| C-1—Disobedience of Rules. | K-2—Unsafe Condition of Building. |
| C-2—Interference by Others. | K-3—Unsafe Condition of Lines. |
| C-3—Fooling. | L-1—Improper Ventilation. |
| D-1—Attention Distracted. | L-2—Improper Light. |
| D-2—Inattention. | L-3—Inadequate Supports, Guys or Braces. |
| E-1—Taking Chances. | M-1—Method of Doing Work Improperly Planned. |
| E-2—Short Cuts. | M-2—Unsafe Layout of Plant. |
| E-3—Haste. | N-1—Proper Personal Safety Equipment Not Available. |
| F-1—Employee Sluggish or Fatigued Mentally. | N-2—Defective Personal Safety Equipment. |
| F-2—Employee Excited or Angry. | N-3—Clothing Loose or Otherwise Dangerous. |
| G-1—Employee Physically Defective. | Z-1—No Person and No Reasonable Safeguard or Precaution Could Have Prevented This Accident. |
| G-2—Employee Fatigued Physically. | |
| G-3—Employee Not Strong Enough Physically. | |
| H-1—Danger Points Inadequately Guarded. | |

THE OBJECT OF THIS REPORT IS TO HELP US FIND OUT HOW AND WHY MEN ARE INJURED, SO THAT STEPS MAY BE TAKEN, WHENEVER POSSIBLE, TO PREVENT SIMILAR INJURIES. "HELP US TO HELP YOU."

8. What Apparatus, Tools, or Material Were Connected With Accident?
9. What Safety Equipment Should Have Been on Machinery, Apparatus, Etc.?
10. What Was Condition of This Safety Equipment and Was It in Place?
11. Was Injured Provided With All Necessary Personal Safety Equipment? (If not, give details)
12. What Was Condition of This Personal Safety Equipment?
13. Was Injured Using All Personal Safety Equipment Which His Work Required? (If not, give details)
14. What Action Will Be Taken to Prevent Future Accidents of This Kind? (Check Class)

Class.....Additional Safeguards.	Class.....New Personal Safety Equipment.
.....Changed or New Tools or Equipment.Additional Personal Safety Equipment.
.....Change in Plant Layout.Discipline.
.....Improved Inspection Methods.Special as Per Detail Below.

Details of Any Class of Action to be Taken

15. Name of Title or Position of Immediate Superior of Injured Party
16. Date, Case No., and Character of Last Previous Accident Occurring Under His Supervision
17. How Far Was Nearest First-Aid Kit From Scene of Accident?
18. Was It Used?
19. What Treatment Was Given by Fellow Workmen?
20. By F-A. Workers From Outside Organization?
21. Who Were These Outside Workers?
22. Name and Address of Doctor Who Treated Case
23. Name and Address of Hospital Where Case Was Treated
24. When and Where Was Last Safety Meeting Attended by Injured Party?
25. What Printed Safety Instruction Has He Received?

Signed

Title or Position

Noted Director of Safety

Date

Comments

are arranged which include outside speakers, motion pictures, music, and other entertaining features. These meetings are held on the fourth Tuesday of every month and are of such interest that all of them are well attended.

Regular training periods for mine rescue and first aid are essential if the instruction is to be kept fresh in the minds of the men, so that they will always be ready to assist others and to help themselves in emergencies. Education is often said to be the cure for unsafe practices. To some extent this is true. Safety education is essential and should be developed to a high degree, but the fact that certain things will not be tolerated is more easily learned than a knowledge of accident hazards.

Safety must come from within rather than from without. This is certainly an essential task, but it is not an impossible one. No learned textbooks have to be digested; no libraries have to be searched; no laboratory work has to be done. The knowledge required is the result of every-day experience and observation.

At Wildwood, with everything performed mechanically, many problems had to be solved and it was done at the face, where we could study the various operations in action. If any progress in accident prevention is to be effected, it must be made at the face. Too many men in safety work today are trying to make a favorable showing in the reduction of accidents by sitting at a desk compiling data from accident reports and do not spend enough time underground.

Everyone appreciates the need for written instructions on safety, but unless these instructions are followed up and enforced in the plant, nothing is accomplished. It is natural for some men to follow the course of least resistance, and as some safety rules require additional steps, they will not be observed, regardless of all written instructions, unless the man can be made to understand that the rules are for his benefit.

The problem of getting the new man started off on the right foot from a safety standpoint is a big one. Under our practice, before a man is permitted to go to work he is made to understand that the most important part of his duty is to avoid getting hurt. Frequently the new man tries to copy everything he sees the old-timer do, and in some cases tries to "go him one better," and too frequently the old-timer sets him a bad

The reason that there are so many

At our sectional safety meetings in the mines we let our men know that we welcome their suggestions on safety, as well as on those operating problems which we feel improve the conditions under which our men must work. To follow such recommendations as our workmen often make

On the first day of the present year a system of discipline of underground employees was introduced. This requires the foreman to penalize

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Table I—Reduction in Compensation Costs for Lost-Time Accidents, 1930
(Fatalities Omitted)

	Tons Pro- duced	Man Hours Work- ed	Non- Fatal Acci- dents	Days Lost	Fre- quency— Accidents Per Million Man Hours	Sever- ity— Days Lost Per Thou- sand Hr.	Total Cost	Cost Per Ton	Tons Per Lost-Time Injury
First Quarter....	157,634	186,358	\$11,948.16	.0758	...
Second Quarter...	211,517	269,571	60	1,176	222.57	4.36	9,805.02	.0463	3,525
Third Quarter...	173,462	223,382	23	359	102.96	1.61	2,328.43	.0134	7,542
Fourth Quarter...	221,967	226,899	19	280	83.73	1.23	2,670.15	.0120	11,682

infractions of the rules with layoffs of various periods of time for the first or second offense and immediate discharge for the third. Since the first of the year discipline has been administered in five cases. So far, the plan is working successfully, for the men are beginning to realize that we will not tolerate any careless practices. Perhaps dismissals for violations of safety rules will never be necessary.

Such discipline as we have established is applied indiscriminately, to our foremen as well as to our workmen. Often when men are found using dangerous methods, and these same men are injured, sometimes fatally, the blame does not rest on them; it is the foreman in charge who is solely responsible. I spend from four to six hours in every day of the week at the working face noting conditions, testing for gas, checking ventilation, watching the manner in which the men perform their work, conditions under which the men are working, method of timbering, etc.

The Double, or Thick, Freeport seam, averaging 8 ft. in thickness, is considered gaseous, though gas is seldom found. Any foreman who, by inadequate ventilation, permits gas to accumulate is given a ten-day layoff. Three foremen have been penalized for this. One foreman was given ten days off for sending drillers into a place, after the timbers had been pulled, to drill a stump which had been left back in the goaf.

All accidents are thoroughly investigated, and these injuries are charged against the foreman. He is held responsible unless the investigation shows that it was beyond his control. If it was due to lack of discipline or supervision, failure to instruct the workman properly in the manner in which to do his work, or failure to remove a hazard, the foreman is held responsible and is laid off temporarily. All of our foremen distinctly understand that we will not stand for lost-time accidents and that the foreman cannot continue long with us if he does not properly instruct his men so as to avoid such accidents. If it is the fault of the

injured, he is laid off temporarily after the doctor has reported that he is able to return to work. For every fatal accident chargeable to lack of supervision, the foreman is immediately dismissed.

Although the foremen and assistant foremen are busied with many duties, one that must be regarded as highly essential is the making of the daily report as to the safety of the mine. It should not be regarded merely as a compliance with the state mining laws but as an integral part of the safety program. Each foreman has to report, in a book provided for that purpose, the condition of the section and the hazards found during the shift.

When I visit the face I often have occasion to question the accuracy of these reports. I recall instances of foremen marking their sections as being in a safe condition, yet an hour later the firebosses would pass through those sections, and on their arrival at the surface would report dangerous roof in one or more places and probably standing gas at some working face.

G. S. McCaa, formerly of the U. S. Bureau of Mines, and now state inspector of the district in which Wildwood is located, submitted to us a daily potential hazard blank, which has been accepted. It forms the lower half of Fig. 1. The blanks have been made in loose-leaf form and issued in loose-leaf covers to mine foremen, firebosses, and all assistants. The assistant in his rounds may see loose top coal in some working place. He notes this on his form with a dash (—) in the appropriate column, and enters also, in the proper place, the number of the entry and the room. The room is then marked with a danger sign, or is "dangered off," as we express it. When the foreman sends men to remove this hazard, he draws a vertical line across the dash, converting it into a plus sign (+). When the foreman visits the place and finds the hazard removed, he puts a circle around the plus sign on the record to indicate that the defect has been corrected. The same procedure is followed with other hazards.

I carry a similar form myself, and in going over the section I note all "potential hazards." Before leaving the section, I compare my sheet with that of my assistant on that section. Then, if the assistant has failed to note a hazard, I take him to the place and show him the dangerous condition. If many of these hazards are overlooked, and this is the first offense, a ten-days' lay off without pay follows. The mine foreman carries a similar sheet and annotates it as he makes his rounds, and he also checks with the assistant before he leaves the section.

This system of reporting and taking care of hazards has reduced the severity of accidents. The system was put into force on the first of the year, and it has been noted that the accidents are entirely different from those recorded last year, when most of the casualties were due to the neglect of foremen and workmen to remove hazards. All hazards are now entered on the foremen's daily report, and all potential hazard reports are turned over to the safety engineer daily.

Every man who is injured and loses time must bring to the safety department a release slip from the doctor before returning to work. This enables the safety department to keep a complete record of all injured men, to talk the accident over with the man and show him how the accident could have been prevented. The men are told that if they have too many accidents they cannot stay long with us, and as they know that a record is kept of their injuries, they will try to avoid them in the future.

A goodly portion of the splendid improvement shown in Table I, from about 7c. to a little over 1c. per ton for lost-time accidents, exclusive of fatalities, is directly traceable to the general safety program sponsored by the general management and furthered by the plant managements. Future progress, therefore, must come as a result of every man as an individual recognizing his "personal obligation" to avoid accident.

Because of three fatalities, two from falls of slate and one from a rock-dusting machine, the record of fatalities has not shown the continuous improvement shown by the lost-time accidents. The output per fatal injury is 254,860 tons and the fatal accident cost per ton is \$0.0237; the frequency rate for fatal accidents is 141.7 and the severity rate 27.53. None of the fatal accidents were attributable to mechanical loading.

ELECTRIFICATION PROBLEMS

« In Dry Cleaning Plants

By W. D. TURNBULL

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Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

MINIMUM operating and maintenance costs will reward a careful coordination and correct application of electrical equipment in a dry cleaning plant. This requires study and consideration of the operation as to its requirements and peculiarities, characteristics of the load, and electrical apparatus.

Correct determination of the selection and application of electrical equipment for a dry cleaning plant involves careful consideration of the following program:

1. Selection of motor as to rating, characteristics, starting torque, pull-out torque, pull-in torque, heating, power factor, and efficiency.
2. Selection of control as to type to provide for the necessary starting and running characteristics, overload protection, flexibility, and sequence operation where required.
3. Location of electrical equipment with respect to accessibility for repair and inspection and with respect to protection from dust, mechanical injury, weather exposure, and hazards.
4. Wiring layout as to cable size, grouping of circuits, and overload protection which will give flexibility of operation and minimum delay in operation in case of trouble.
5. Power-factor correction with the use of synchronous motors where possible and desirable.

Table I gives a tabulation of motor sizes and applications for a 300-ton-per-hour plant.

Conveyors generally are of constant speed and are driven by squirrel-cage motors controlled by full voltage; that is, across-the-line starters. The starting torque required varies from $1\frac{1}{2}$ to $2\frac{1}{4}$ times full-load torque. Motor torque in foot-pounds is equal to the horsepower $\times 5,250 \div$ motor speed in revolutions per minute. Thus, in the case of a 10-hp. 1,160 full-load r.p.m. motor the full-load torque would be $10 \times 5,250 \div 1,160 = 445$ ft.-lb. If the motor has a starting torque of $2 \times$ full-load torque then we would have 445×2 , or 890 ft.-lb. starting torque.

A motor should be selected with a starting torque that will provide some margin over that calculated, to take care of unusual starting condi-

tions due to extra heavy loading, dirty or dusty rollers, general sluggish condition, such as encountered on cold mornings, and low voltage. The torque of a squirrel-cage motor varies approximately as the square of the voltage. That is, a decrease from normal voltage of 10 per cent causes a decrease in torque of approximately 20 per cent.

To insure sufficient starting torque, oversized motors have often been used. With full load on the conveyors the motors operate at less than their full load and with a resultant low power factor. This is uneconomical and, with a few exceptions, also undesirable. Where starting torques are required that are beyond the range of high-starting-torque squirrel-cage motors, the application requires wound-rotor motors. Often even where the starting torque is within the range of the high-torque squirrel-cage motor or the normal starting torque squirrel-cage motor, the wound-rotor motor is preferable. This holds for large or long conveyors where there is much in-

ertia. For these applications the wound-rotor motor with several accelerating points adjusted to give smooth, easy starting, will greatly reduce maintenance on the conveyor and driving unit.

Squirrel-cage motors are generally used also on rotary feeders, shaker screens, loading booms, dust collectors, picking tables, and small fans. Wound-rotor motors are used on applications requiring speed control or where the size of the motor is such that the starting current of the squirrel-cage motor would be objectionable or where low torques are desirable during starting to minimize shock or strain on the drive.

Wound-rotor motors are desirable where reciprocating feeders, large conveyors, car hauls, crushers, table drives—both primary and re-treatment—are to be driven. In the selection of motors for the tables, wound-rotor motors with starting torque of approximately $2\frac{1}{2}$ times full-load torque should be selected and the

Table I—Motor Sheet for 300-ton-per-hr. Dry-Cleaning Plant

Number of Units	Horse-power	Synchronous Speed	Type	Application
1	14	1,800	CS	Belt cleaner
1	60	720	CS	Crusher
1	50	900	CS	Slack and raw-coal conveyor
1	25	900	CS	Shaker screen
1	30/20	900/600	CS	Clean coarse-coal conveyor belt
2	20	900	CS	Clean fine-coal conveyor belt
2	15	900	CS	Degradation screen
1	15	900	CS	Loading boom
1	7 $\frac{1}{2}$	1,160	CS	Clean fine-coal flight conveyor
1	7 $\frac{1}{2}$	1,160	CS	Clean coal-distributing conveyor
1	20	900	CS	Final refuse-conveyor drive
1	5	1,160	CS	Degradation-screen conveyor
1	3	1,800	*CS Elev.	Loading-boom hoist
1	30	900	†CW	Final treatment table
2	30	900	†CW	Primary treatment table
2	30	900	†CW	Re-treatment table
2	200	600	‡Syn.	Primary table and re-treatment table fan
1	100	900	‡11	Final treatment table fan
1	15	900	CS	Distributing conveyor
1	15	900	CS	Primary middlings conveyor
1	15	900	CS	Dust screw conveyor
1	15	900	CS	Double distributing conveyor
1	15	900	CS	Clean-coal elevator
1	15	900	CS	Final recirculating elevator
1	25	900	CS	Raw-coal conveyor drive
1	10	900	CS	Primary middlings elevator
2	30	900	CS	No. 1 and No. 2 distributing conveyor
2	5	1,200	CS	Primary table feeders
2	5	1,200	CS	Re-treatment-table feeders
1	5	1,200	CS	Screw conveyor

All motors of sealed-sleeve type, rated 40 deg. C. continuous except *loading-boom hoist motor, which is 50 deg. C. intermittent rated; CS=squirrel cage; CW=wound rotor; Syn=Synchronous motor; Elev.=Elevator type; †=High-starting-torque wound-rotor motors; ‡=80 per cent Power Factor synchronous motors.

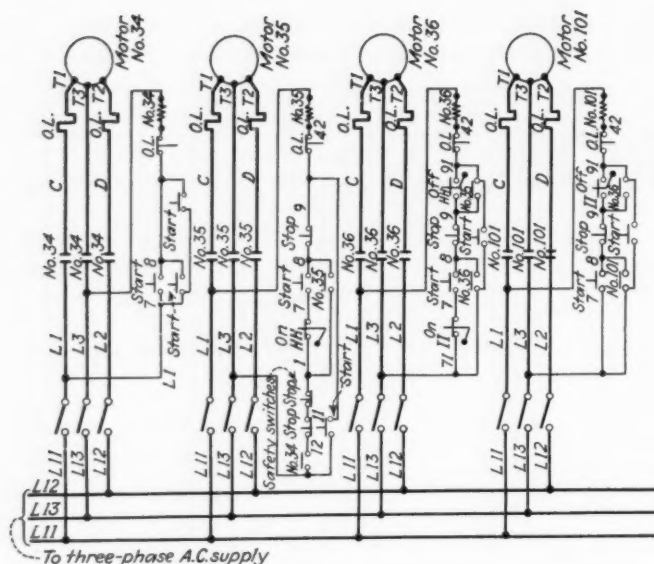


Fig. 1—Control in Which Circuits Are Progressively Interlocked to Give Sequence in Starting and Stopping

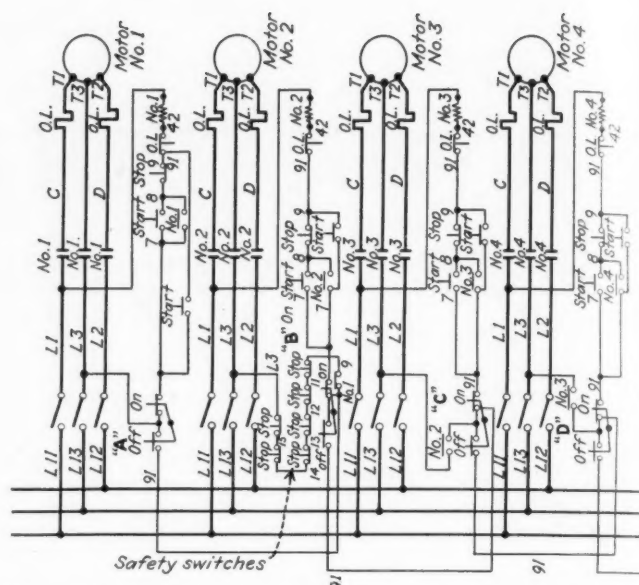


Fig. 2—Interlocking Control Scheme for Starting Against the Flow of Material and Stopping in the Reverse Order

control arranged to give smooth acceleration.

Except in the case of the crusher drive the pull-out torque is not of great importance in dry cleaning-plant applications, for this characteristic usually will be found sufficient if the motor has sufficient starting torque and continuous rating. The crusher, however, should be equipped with a motor having a pull-out of from 2 to 2½ times full-load torque.

What appears to be a justifiable application for the table motors or other wound-rotor motors located where there is an exceptionally dusty atmosphere is the use of explosion-tested collector-ring housings. For, in addition to guarding against explosion hazards, the collectors and brushes are protected from the dust and possible creepage trouble between collectors.

With this exception, the only other features on the motor that require protection from the dust are the bearings, which should be of the sealed type. Dry coal dust has no harmful effect on the insulation of modern squirrel-cage or wound-rotor motor windings; however, if allowed to collect and pack into the motor windings, they will restrict ventilation and cause overheating. Occasional blowing or cleaning will prolong the life of the windings.

Both squirrel-cage and wound-rotor motors operate at a power factor of somewhat less than 100 per cent, a figure which decreases as the motor load is reduced, so that from the point of view of power factor, motors should be selected that will operate near their full-load rating. The power factor should be corrected by

using synchronous motors where possible.

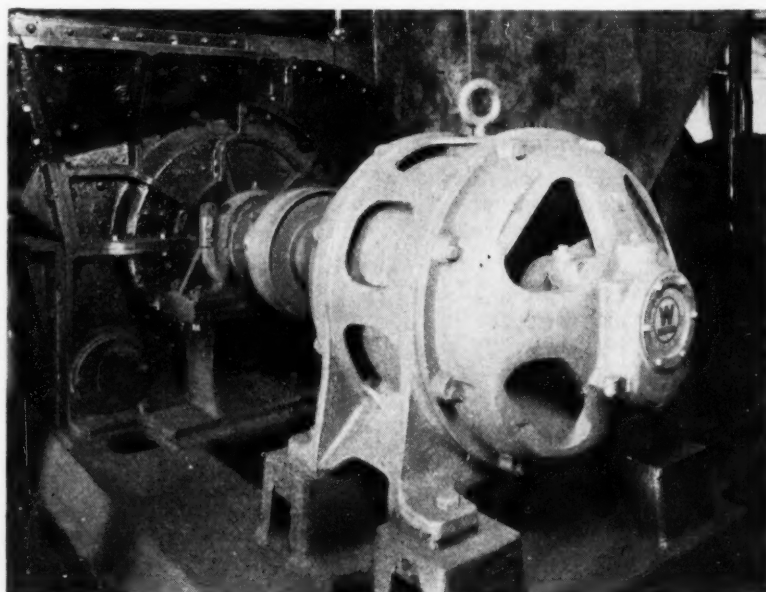
An ideal application of the synchronous motor is to the fan drive furnishing air to the table. What power-factor correction will afford the greatest economy depends on the nature of the power contract. A fan is considered light-starting, the load building up on the motor approximately as the cube of the fan speed, imposing full load on the motor at full speed. As it is at this point that the synchronous motor pulls into step, the motor must have at least 100-per cent pull-in torque, and preferably 120-per cent, to take care of possible voltage variation. The desirable motor for this application would be a synchronous unit with a low starting and a 120-per cent pull-in torque. The starting and pull-in

torques vary as the square of the applied voltage.

Motors that are operating continuously or over a considerable period of time should be rated on the 40-deg. C. continuous basis. Those operating on intermittent service, such as raising and lowering booms, can be rated on a 50 deg. C., ½-hour or 1-hour basis. The need for efficiency in an intermittent-duty motor is not so important as with motors that operate continuously or over long periods of time. Hence, for the intermittent-duty cycle applications a higher resistance intermittent-duty type motor such as the alternating-current elevator motor is preferable. This motor will be on a smaller frame and consequently cheaper than one with continuous rating.

The simplest control for the squirrel-

Squirrel-Cage Motor With Sealed-Sleeve Bearings



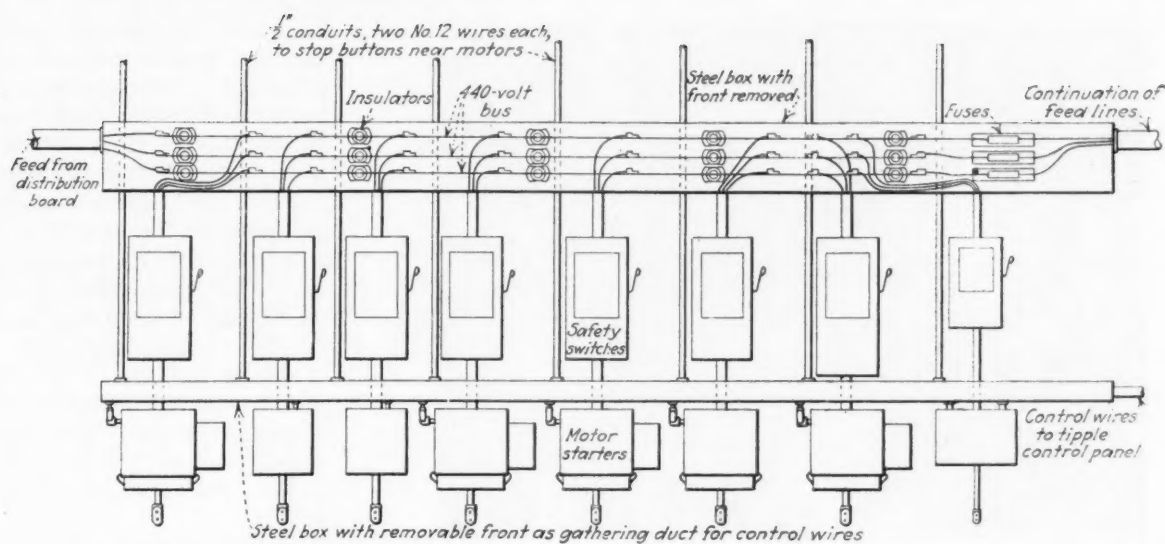


Fig. 3—Long Boxes of Steel House the Buses and Connections and Gather the Control Wires

rel-cage motor is the full-voltage across-the-line starter equipped with thermal overload relay and used in connection with a fused safety switch. It provides adequate control and protection for either a normal or a high-starting-torque motor. Reduced-voltage starters are desirable for some applications, particularly on the larger size squirrel-cage motors or where there is much shock or play in mechanical equipment or drive. The starter can be adjusted so that the torque developed on the first point is merely sufficient to take up the slack or start the equipment moving slowly, which will then come up to speed on the second or full-voltage point. This type of control provides smooth, easy accelerating and, where it is required, it more than justifies the additional expense of the reduced-voltage starter. Both the across-the-

line and the reduced-voltage starters should be of the magnetic remote-control pushbutton-operated type. This also applies to the wound-rotor motor control, except for applications requiring speed control, such as a car haul feeding a rotary dump, where either a drum controller or a magnetic controller with drum master switch should be used.

The synchronous motor driving the fan can be controlled by a full-voltage or reduced-voltage manually operated or magnetic pushbutton-operated type control, the selection depending upon the conditions. However, since the fan requires but a very small starting torque, it would seem to be preferable to use a reduced-voltage starter, even though it is a little more expensive and a little more complicated. It is justified by the fact that it takes less power from

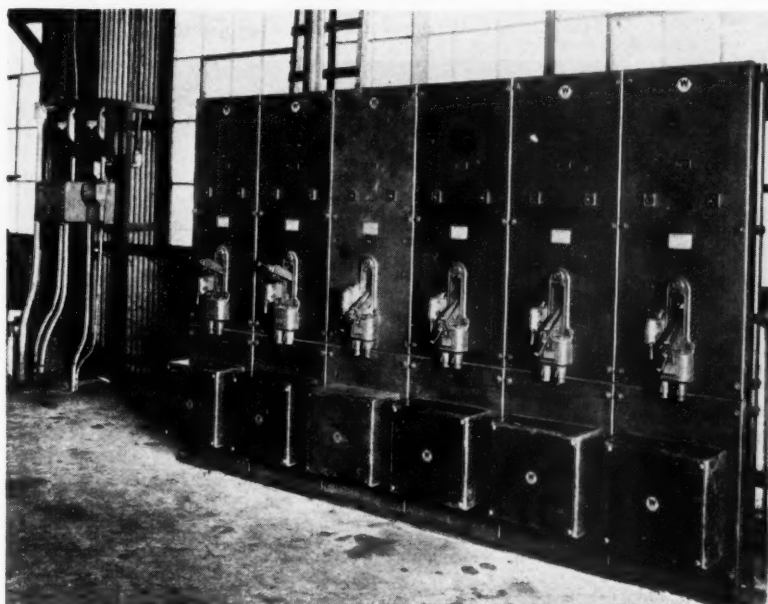
the line during starting and is easier on the driving equipment. The reduced-voltage starter will develop all the torque that is required for starting the fan.

The scheme of sequence operation and interlocking depends on the flow of material. Starting of feeder conveyors, screens, and table should be progressive against the direction of flow, stopping in the reverse order so as to prevent piling up or overflowing of material such as would occur with a running conveyor discharging onto a stalled conveyor or table. This sequence operation is accomplished by electrically interlocking the controllers in the proper order.

Fig. 1 illustrates a simple scheme of interlocking control in which the control circuits are progressively interlocked to give sequence starting and stopping. Motor 34 of this group is independent and not interlocked with the other motors of this group. Motors 35, 36, and 101 are interlocked. The closing of the main contactor 35 closes an interlock 35 in the control circuit of motor 36. Closing of main controller 36 closes an interlock 36 in the control circuit of motor 101.

On-and-off button HH in control 35-36 and II of control 36 and 101 permit operating the remaining motors when, for any reason, it is necessary to shut down one of them. For instance, if it were desired to shut down motor 36 and run the others, 34, 35, and 101, button II on control circuit 36 would be pushed to the "off" position, which would shunt 36 interlock on the control circuit 101. The "stop" button could then be pushed on control 36, shutting down the motor 36

Circuit Breaker Feeder Panel With Test Instrument Jack Receptacles



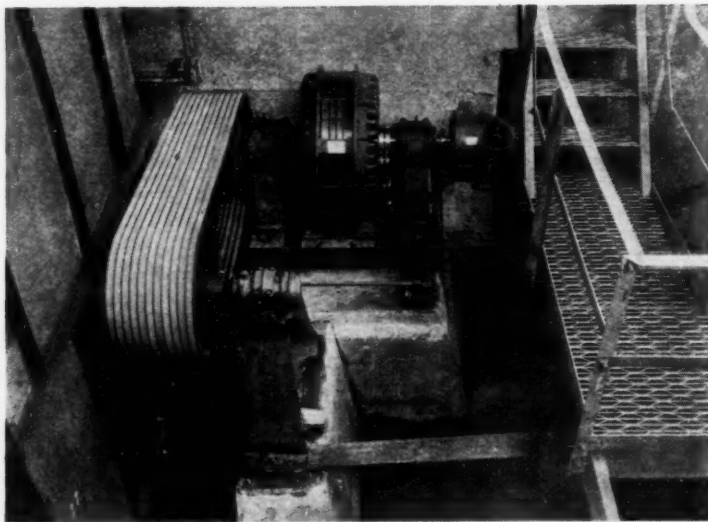


Table Fan Drive: 200-Hp. 600-R.P.M. Synchronous Motor

without interfering with either motor 35 or 101.

Each motor is provided with an inch button which permits operating any motor regardless of whether the other motors are operating or not; also, regardless of the set-up of sequence switches. This is a single-spring return pushbutton, the motor operating only so long as the pushbutton is held down. It is intended to permit operation for testing the motor or conveyor or for making repairs. Several stop buttons are provided which should be located in various places about the plant for emergency stopping.

Fig. 2 shows an interlock control scheme for starting against the direction of flow and stopping in reverse order. This scheme is arranged so that any motor can be taken out of the group and still retain the sequence for both starting and stopping. The interlocking scheme used depends, of course, upon the operating system. Various schemes and combinations of schemes can be devised to meet almost any operating requirements.

Power circuits, feeder, branch, and control should be so arranged that wiring trouble or blown fuses would affect only a certain group or groups, so as to insure the operating protection for which the interlocking or sequence system was designed.

The switchboard, if possible, should be located in a separate room remote from the dust-laden atmosphere and ventilated with clean air. The meters and high-voltage equipment should be protected from the dust. Desirable accessories on the switchboard are the instrument test terminals by which test meters

can be connected in the circuit for test purposes without breaking circuits or interrupting operation.

Fig. 3 shows an excellent arrangement for mounting and wiring of starters, and safety switches. Connections are made directly to the bare copper strap buses, which are inclosed and protected in a sheet-steel box with removable front. The switches and starters are mounted on a skeleton steel frame. The wiring is run in solid conduit.

Accessibility to permit easy inspection and maintenance of motors and control and other electrical apparatus justifies some additional expense and trouble in planning and construction. It is a matter of experience that equipment located in positions that render inspection and maintenance difficult is usually neglected.

Safety to men and equipment is a primary consideration and should

be carried through the entire layout. Gearing, chains, and belts should be protected. Access to the high-voltage busbar and switchboard room should be limited to those whose duty it is to care for this equipment.

From the safety standpoint the grouping of the control is very desirable in that it prevents unauthorized and incompetent people from molesting or attempting its operation. If properly segregated and grouped it can be put under the supervision of one operator whose responsibility it will be to start and stop all the apparatus controlling the plant from signals received from various sources.

Such a layout is indicated in the illustration below, which shows a benchboard arrangement of push-buttons located in such a way that the correct sequence operation is carried out when the buttons are pushed, starting the top row on the left-hand side and continuing straight across the row, and then on to the second row, etc. Each pushbutton is provided with a signal lamp which burns red or green to indicate whether the motor which is controlled by that button is running. Additional buttons should be located at or near the motor, which can be pushed to the "off" position and locked, insuring that the motor will not be started while men are working on the machinery.

Standardization and duplication of apparatus, motors, control, pulleys, belts, gears, etc., should be made wherever feasible, as a means of reducing maintenance and spare-part costs. This is such an important factor that it often justifies the use of oversize motors.

Pushbuttons Arranged for Sequence Control



STUDYING AIR PRESSURE

« To Cut Fan Costs

By HENRY BRIGGS

Hood Professor of Mining
Edinburgh University
Edinburgh, Scotland

FOR those engaged in experimental inquiries, an occasional stock taking is by no means undesirable. Seven years ago, I summarized for *Coal Age*¹ the position that mine ventilation—more particularly in its theoretical aspects—then occupied. The time seems ripe for another survey of the kind. My purpose, then, is to try to present, as concisely as possible, the main results obtained since the previous summary was published. It should not be reckoned to my discredit that, in so doing, I omit reference to recent work on ventilation by American investigators; I am fully appreciative of the value of their researches and have repeatedly found them helpful in my own inquiries. My reason for restricting the stock taking to British products for the most part is, first, that the American researches have already been well reported in *Coal Age*, and secondly, that I am more qualified to deal with matters in which I have had personal experience.

Applied science has its fashions as well as art. In 1923, the date of my previous summary, the subject of ventilation was attracting the attention of many workers. At the present time, the spotlight has moved away to other aspects of mining technology, and after a spate of papers and books, comparatively little fresh material on ventilation has appeared.

The three most notable advances in this subject of the last three years have been, in order of importance, the development and extended application of the Steart airscrew fan, the introduction of air-pressure surveys, and the progress of the researches into the conditions in hot and deep mines, the latter being carried out under Prof.

J. S. Haldane's leadership by a committee of the Institution of Mining Engineers. Otherwise, the position in this country rests much where it was in 1928, when my book on the "Ventilation of Mines"² was issued—a volume itself designed to epitomize the outcome of the experimental work of the preceding few years. This article and the one that will follow will deal with air-pressure surveys and the third with the air-screw fan.

Units of Resistance—A change in the method of expressing the ventilating resistance of a mine was advocated in the paper in *Coal Age* to which I have referred. It was there pointed out that the suggestion of Dr. J. S. Penman,³ of the Indian School of Mines, to make use of a direct unit of resistance as nearly as possible comparable with the ohm in electrical practice was logical and helpful.

Penman's proposal was based on the usually accepted relation:

$$p = R Q^2$$

where p is the ventilating pressure and Q the volume in circulation in the road, section, or mine concerned. R , a factor embracing all such quantities as the sections of the various airways, their rubbing surfaces and coefficients of friction, is the resistance of the system. The suggestion that the unit of resistance should be called the *atkinson* was accepted by a committee of the Institution of Mining Engineers, and that name has passed into currency. According to that committee's finding, the resistance in *atkinsons* is ascertained by dividing p in pounds per square foot by the

square of the air quantity expressed in thousands of cubic feet per second (kilocusecs).

The conception of resistance being simpler than that of the equivalent orifice, the ascendancy of the former seemed a probable outcome; but it has to be allowed that that result has not been achieved. The equivalent orifice (a measure, by the way, of conductance; not of resistance) remains in general use; whatever may be the verdict of the future on these rival units, the equivalent orifice is too securely rooted with the present generation to be displaced. Moreover, as we shall see in the article which will follow this, it is the more serviceable criterion of the two in making certain calculations relating to fans.

Both measures are useful in ventilation problems, the *atkinson* especially when evaluating the effect of resistances in series and the equivalent orifice when dealing with resistances in parallel. The total resistance in *atkinsons* of a number of resistances arranged in series is the sum of their several resistances in *atkinsons*, whereas the equivalent orifice of two or more splits in parallel is the sum of their several equivalent orifices.

The p, Q Relationship—Both units depend on the proposition that ventilating pressure is proportional to the square of the air volume passing in unit time, and would be equally at fault in the event of that relation proving untrue. We have, of course, long known that that relationship should be regarded as approximate only, and that an expression connecting p and Q , if it is to satisfy a rigorous mathematical scrutiny, must

¹"Developments in the Theory of Centrifugal Fans," *Coal Age*, Vol. 23, 1923.

²Methuen & Co., London, 1928.

³*Transactions, Institution of Mining Engineers*, LXII, 1921, p. 39.

include several other factors, such as the temperature, viscosity, and hygrometric state of the air.

It would, however, be unnecessary and indeed unwise to trouble about these refinements in dealing with the ventilation of so complex and variable an agglomeration of passages as a mine, providing we can make sure that the formula, $p = RQ^2$ is sufficiently near the truth for practical purposes. Three or four years ago I and my associates took much trouble to test the p, Q relationship at twelve British collieries.⁴

It being desired to investigate that relation for the entire mine, the measurements were made in the fan drift, at different fan speeds, and they were therefore affected by the natural ventilation operating at the time. The correction for the natural ventilating pressure proved to be far from easy, and it became necessary to look closely into the whole subject of natural ventilation and its mode of action while a fan is running.

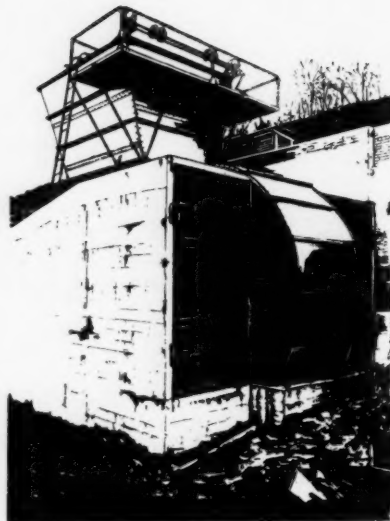
Leaving the question of natural ventilation to be discussed in my next section, it will be enough to state now that, if p is the total ventilating pressure effective for the time being on the mine (whether altogether produced by artificial, or partly by artificial and partly by natural, means), the relation $p = RQ^2$ is sufficiently exact to be acceptable over the normal range of fan speed.

When natural ventilation is present to an appreciable extent, however, and when, in addition, the fan is much slowed down or is stopped, the law usually changes. This fact, though clearly established and of great theoretical interest, need not concern us further here, as the alteration always occurs at speeds well below those at which the fan is likely to be run in actual practice.

Our investigation may, I think, be regarded as a satisfactory vindication of Atkinson's law when the volumes circulating through the mine are not widely different from those required in normal working. From this general point of view, then, either the direct unit of resistance or the equivalent orifice may be adopted without hesitation for all the purposes to which they are commonly applied.

Natural Ventilating Pressure—When the workings of a mine are limited to a single flat seam approached by two shafts, the natural ventilating pressure (N.V.P.) may

⁴Transactions, Institution Mining Engineers, LXXIII, 1927, p. 41.



easily be calculated from the depth of the seam and the mean density of the air in the shafts. But when the deposit is inclined, or when it is complicated by workings in two or more seams, any calculation of the kind is difficult and of dubious value; to ascertain the N.V.P. one ought then to have recourse to experiment.

So far as I am aware, the first experimental determination of the N.V.P. was made by D. Murgue, the French engineer, in 1872, at the Cr  al colliery. Murgue placed a temporary, close-fitting door in the fan drift and passed the tube of a water gage through it. Stopping the fan and closing the door, he read the gage. A result so obtained will be a more accurate measure of the N.V.P. when the shafts connect to a single seam only; when two seams, say, are being worked, the stoppage of the air in the drift does not bring about a cessation of ventilation, as the air in the higher seam reverses and a closed underground circuit is established. That objection can be minimized, however, by taking the reading promptly after closing the door.

A method that I have found to be fairly reliable is as follows: Measure the air quantity and the fan-drift pressure—the latter by aid of a tube turned to face the current—at a number of fan speeds, ranging, say, from half the normal speed to 25 per cent above normal speed. Plot pressure against quantity and ascertain the equation of the curve obtained. That equation can be written in the general form

$$p = RQ^2 \pm K.$$

The value of K is an approximate measure of the N.V.P. in the same units as p , and R is the mine resistance. If K is preceded by a minus sign the natural ventilation assists the

fan; if by a plus sign it opposes the fan.

The Manometric Efficiency—In my 1923 summary I characterized the manometric efficiency of a fan (*i.e.*, the ratio of the actual to the "theoretical" water gage) as the best criterion we possess of the suitability of design. Much space was consumed in showing how that efficiency may be obtained and in indicating how it may be applied as a means of evaluating the losses of power in the fan plant. In regard to the manner of derivation I have no criticism to offer; but as to its value I have to admit that it has not come up to expectations.

To be candid, fuller consideration in the light of experimental data has relegated the manometric efficiency to the background. It fails to be of much service because it does not cover all the losses that occur within a fan. The calculation of the denominator of the ratio—namely, the so-called theoretical water-gage—rests on the assumption that the air passes out uniformly from all parts of a fan wheel, and that re-entry is absent. Actually, re-entry is a prominent factor, no less than seven distinct varieties having been recognized⁵ in the centrifugal fan.

One form, termed centripetal re-entry—an important form with fans having shallow blades—causes the air passing out from one section of the wheel's periphery to return inward through another part. In other words, the actual fan works in a manner unlike that of the perfect fan envisaged when computing the theoretical water-gage: it is, in effect, a different machine, and a machine, moreover, which functions differently against different resistances. Thus it comes about that the circumstances yielding the actual water gage are not commensurable with those imagined when calculating the theoretical gage; the comparison of the two values loses touch with reality; in consequence, it is of only slight utility, so far as I am able to judge at present.

Pressure-Quantity Surveying—In 1927, D. Farr Davies, a mining engineer in charge of a large group of anthracite mines in South Wales, described in a paper read before the South Wales Institute of Engineers,⁶ a number of ventilation tests made at mines under his direction. The tests were of a simple character, such

⁵Transactions, Institution Mining Engineers, LXVII, 1924, p. 84.

⁶Proceedings, XLIII, p. 471.

as can readily be performed by a colliery manager.

They consisted of ascertaining, by means of the ordinary U-tube, the pressure-difference between intake and return at all places (for example, at separation doors) at which that difference could be easily obtained. The water-gage measurements were supplemented by quantity measurements made with an anemometer.

Both sets of values were depicted as ordinates on charts in which distances from the shafts were scaled horizontally. The quantity measurements gave definite information as to the incidence of leakage, which, indeed, proved to be of large magnitude.

Elementary though the investigation was, it served two useful purposes: In the first place, it was the means of bringing into effect many improvements, mainly directed against leakage, in the pits in question. In the second, the tests convinced their promoter of the advisability of placing the organization and control of mine ventilation in the hands of trained specialists, and, so far as his own collieries are concerned, these matters are now under the direction of a ventilation engineer.

Shortly after the publication of Mr. Davies' communication, another paper conceived on much more ambitious lines was read before the same institute.⁷ This latter paper, entitled "The Determination of Pressure Losses in Mine Ventilation," described tests carried out during the period 1924 to 1928 by E. Ivor David and A. L. Davies at certain mines of the Powell Duffryn Steam Coal Co., Ltd., South Wales.

Truly a pioneer piece of research, and one likely to prove of lasting importance, it shows how the pressure varied in proceeding from point to point along the airways, in some cases from the top of the downcast shaft to the top of the upcast. The investigation being especially concerned with pressure losses due to friction and shock, great care was taken to guard against or eliminate other factors affecting underground pressures,

such as natural ventilation, normal variations of the barometer, and differences of velocity head.

The authors' explanation of the process of summation of artificial and natural ventilating effects is a model of careful reasoning, and should be studied by all who have to handle this difficult question quantitatively. The instrument they used to measure pressures was a 5-in. aneroid barometer reading to 0.001 in. of mercury (0.014 in. of water column); it was capable of indicating small differences of altitude at the surface to within 2 or 3 ft. of the true value. Other instruments, possessing greater sensitivity, are now being tried by later workers in this field.

Early though it may be to attempt anything like a complete estimation of the practical value of pressure-quantity surveys of the airways of a mine, the following conclusions appear to me to be justified:

1. When properly conducted and set forth, a pressure-quantity survey allows one to ascertain the leakage at different parts of the system and to place one's finger on those parts requiring especial attention in this regard.

2. When properly analyzed, such a survey enables leakage and road resistance to be assessed in relation to their relative effects on variations of pressure along the road. Thus it decides which of these influences is the more important at any part of the pit, and whether it is better to seek improvement by attention to leakage or by enlarging or straightening the airways or by smoothing their walls. When leakage is present, the ordinary law of road resistance, $p = RQ^2$, requires modification; and it may be shown that, when (owing to leakage)

the quantity diminishes uniformly along a stretch of road of uniform section, the rule becomes:

$$p = \frac{R}{3} (Q_1^2 + Q_1 Q_2 + Q_2^2),$$

where Q_1 is the volume passing at one end of the stretch and Q_2 is the volume passing at the other.

3. The only suitable way of recording a pressure-quantity survey is on a copy of the mine plan, all pressures being reduced, after correction, to a common standard or datum. To be fully informative, the plan also should give the dimensions of the various airways and their character, whether timber supported, inclined, arched, or otherwise.

4. In almost every mine there are certain spots in the airways (at regulators, constrictions, and sharp corners) where the air encounters undue resistance. By drawing attention to them, the survey does much toward improvement of the conditions at these points.

5. In addition to any complete survey, it is advisable periodically to measure pressure differences between certain key positions in the mine, so that the effect of changes in the system may be kept under observation. With but few exceptions, the only pressure known to the colliery manager is that read from the water gage connected with the fan drift. This gives no information as to the distribution of pressure across the splits, and is of only slight value in maintaining an effective and efficient ventilating system.

When it is remembered that ventilation is one of the most important items of cost of running a colliery; that at some large mines it involves an annual expenditure of \$50,000 or more; and that most of the money is wasted in leakage, no one can legitimately object to the trouble of investigating the subject as thoroughly and scientifically as our knowledge allows. A full-scale pressure-quantity test is an arduous task, but gets right down to the root of things, and, in the hands of a competent ventilation engineer, is capable of furnishing results which are not obtainable in any other way.



⁷*Ibid.*, XLIV, p. 393.

COAL AGE

SYDNEY A. HALE, *Editor*

NEW YORK, MAY, 1931

Real ammunition

COMPILATION of monthly or quarterly reports on small stoker sales has been recommended to the Committee of Ten by the Commercial Research Section of the Market Research Institute of the National Coal Association. This recommendation is part of a proposed program which also includes continuous study of the anti-smoke movement in the United States, study of the possibilities of enlarging the consumption of coal through a campaign for better home heating, and analytical scrutiny of competitive fuel sales.

First place is here given to reports on stoker sales—not because the other proposals are less important, but because collection of these reports ought to be an easy task and because the material collected can be readily dramatized for the good of the industry. It is known in a general way, of course, that the small stoker has made tremendous strides in the domestic field, but there are no industry figures currently available comparable to the data released by the oil-burner manufacturers. The coal industry and its allies should not trail the oil interests in progressiveness.

Publication of such data on stoker sales would be one of the most effective weapons the coal industry could place in its sales arsenal. To show the public at large that month by month more home owners were modernizing their domestic heating with solid fuel would be an impressive and convincing argument. "Keeping up with the Joneses" has an appeal upon which shrewd merchandisers in other fields are constantly capitalizing; coal and its allies can make the same appeal.

Cost of supplying air

SPEAKING before the Anthracite Club of Rochester, N. Y., Noah H. Swayne, former executive director, Anthracite Institute, declared that 18½ tons of air was delivered in the average hard-coal mine for every ton of coal mined. This figure was prepared for the retailers of coal, but it is equally important that it should be borne in mind by the producers of that product, many of whom rarely calculate the weight of the air they are circulating or consider the cost of ventilation and its capitalized value. If they did, there probably would be greater care of stoppings and overcasts, greater height and width

in entries, less uncleaned falls in headings, more shafts to shorten the travel of the air, greater care to ease it round curves, and less places provided for ventilation.

Unfortunately, though there are charges on cost sheets for power, the power used by the fan is not recorded separately, so the average manager does not become much concerned with the cost of power delivered to the fan or with the outlay he could legitimately make to reduce the cost. His power bill is a bulk statement, and he has no clear idea where it is being expended. If the facts were known and appreciated, greater effort might be made to increase the efficiency, and it might not be so difficult to get the wherewithal for the owner by which to do so.

Tons of air per ton of coal is a popular figure without much real value, but kilowatts per ton of coal for ventilation is a memorandum that would stimulate to action, for it would give an idea of the money that might be expended with gain in bettering airways. Similar figures presented in Great Britain have stirred up no little interest in a subject that lack of data has caused to be overlooked. The ventilation tax is one that is borne with equanimity because it is an impost that is not generally recognized. Evidences are many that American companies are beginning to view their ventilation bills with alarm.

Tenure of office

AMONG the many excellent points embodied in the program of the safety committee of the National Coal Association is the suggestion that local, or district, groups of operators, working in cooperation with state mine inspectors, "would be able to improve the tenure of office and the character of the mine inspecting personnel." Translating this general suggestion into a specific program to bring state mine inspection departments under some form of civil service hardly appears a violent distortion of the original text. Indeed, that very idea has been touched upon in informal discussion of the safety work.

While state statutes generally prescribe certain qualifications for appointees to mine inspection positions, only Colorado and Maryland bring the corps from chief to district inspector under civil service regulations as such provisions commonly are understood. In the majority of coal-producing states, the post of chief mine inspector, or its equivalent, is in the category of appointive offices. As a result, almost every year, the tenure of some chief who has made an outstanding record is endangered because his political affiliations differ from those of a newly elected governor. From time to time, reappointment trembles in the balance and some capable men lose out, unsung victims of the patronage system.

If there is one branch of public service which

should be freed of political spoils pressure, it is a branch, such as mine inspection, devoted to promoting the safety of life and limb. Every chief inspector and every assistant should be in a position where they can exercise the duties of their offices without fear or favor and without regard to any political future. The coal industry can give no better proof of its genuine belief in safety than wholehearted inauguration of a campaign to make competent mine-inspection personnel independent of political favor and industrial pressure.

Price has its effect

OVERMUCH confidence should not be placed in the declaration that, as there is a definitely limited market for coal, the only reason why an operator should lower his costs is that he may compete with some other operator for his share of that limited tonnage, for it is a fact that the coal market can be expanded by lowered prices. Just as the high realizations of the post-war period helped to introduce the economies from which the industry is suffering, so will low prices introduce practices that will widen the market for coal.

In the winter, many families cease to use rooms that in the summer are most in demand. Sun parlors in particular are vacated, despite their cheery appeal. Other places, such as garages, are not heated at all. Vestibules are left cold. If the cost of warming these places were lowered by a decreased price for coal, they would be more generally warmed. Moreover, the cost of heating often directly or indirectly determines the number of rooms a family will occupy. Today, however, it is questionable whether economy in the use of coal is the major reason in some dwellings for the failure to heat all the rooms. In many cases these rooms are kept cold because the furnace, unless run to an excessive overload, with possible clinking, will not heat all the rooms of the house.

Larger furnaces and furnaces in better condition which would give all the heat necessary without crowding would dispose the householder to heat all his rooms and heat them adequately at all times. For often when additions are made to homes and other buildings the furnace is not replaced by one more adequate to meet the larger heat demand. As the furnace was often unequal to the task before the new building, it is still more unequal when the call is made to heat more rooms.

A campaign for larger and better-kept furnaces would be more effective than one urging greater lavishness in the use of heat, for with the more adequate equipment the householder would have the ability to provide himself with greater comfort and would avail himself of it. And further, the more heat he became accustomed to require, the less likely he would be to seek his heat in a more expensive market such as gas or oil.

Thus low price is a common need. It is not to

be regarded as a means of beating a rival coal producer but as a way of holding the business of the industry and of expanding it. Coal men, therefore, have a common interest in production economy and should pool their information so as to reduce costs. Men who thus show themselves "good scouts" are likely to be equally averse to obeying jungle law when seeking coal contracts.

Amortize present values

IN the last analysis, machinery and plant are amortized on a firm's books not for the purpose of recovering the expenditures made but to replace the purchased entity when it wears out. The correct term is not "amortization" but rather "replacement charge," and accurate accounting would require that where a machine or plant that has a normal life of ten years has run five of those years, a replacement fund shall have been accumulated capable of taking care of half the cost of replacement at present prices.

According to Thomas B. Frank, in *Iron Age*, a former excessive or a former bargain cost should not govern the replacement fund nor any other than present-day costs. The replacement fund which has been provided may not have been keeping pace with the rising or falling costs of replacements; for this reason the total replacement fund to date should be yearly adjusted by a lump allowance to equal the amortization that would have been chargeable had the unit at the time of purchase been acquired at present prices.

Thus at the time of yearly adjustments, when prices have risen abnormally, there would be an unusually large replacement charge to make up for the several years in which the allowance had been made too low, as would naturally happen if during that time the price of machinery rose less than later, or was stable or, perhaps, declined. At other times, when the books were being balanced, the replacement charge for the year might be unusually low. Though the revision would always be made in accordance with correct principles, it would at the same time on the whole be helpful to stockholders in times of stress, for then present values would decline and the replacement charge might be far less than the usual provision for amortization would be.

In accounting, much depends on what the investor wants. With coal lands perhaps what he wants is his money back—with a profit, of course, on its use during the time of its employment—or perhaps what he seeks is a replenishment of the lands, the ability of his capital to go on earning indefinitely from its replacement fund without depletion of first-form values. The argument lies therefore between form and money values. As the latter have usually tended to increase over long periods of time, it behooves a prudent man to protect his form values sedulously by a form of amortization that recognizes changes in money value.

NOTES

... from Across the Sea

FOR many years the Germans have emphasized the importance of backfilling, the practice being forced on the mine owners by law. Apparently some, at least, of the operators do not favor the practice, except where buildings have to be supported. Only a few months back some of them were in America to see our methods of mining without backfilling, hopeful that they might obtain some new light on the problem; with what result was not learned.

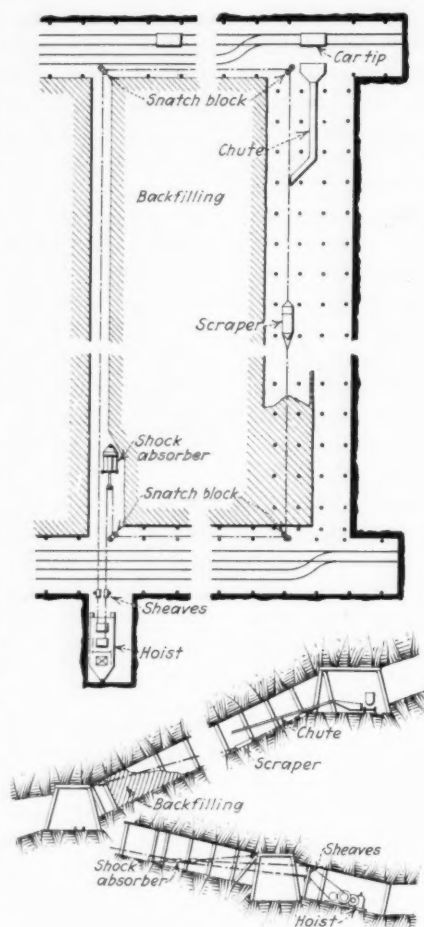
They knew well that without backfilling mining would lower the soil much more than with backfilling, but, seeing that mining, with even the most meticulous backfilling methods, caused so much subsidence that the surface became inundated and had to be kept dry by pumping, they thought it might be just as well to omit backfilling and let the surface down still further. No more water would have to be pumped off the farms, though the lift would be greater. Thus though the expense above ground would not be greatly increased, below ground large savings would be effected.

But backfilling has other advantages than surface support. Some of these are universal and others are of importance only in some localities. Much crush is avoided, the necessity for the use of yielding road linings is decreased, the percentage of yield required from these supports is reduced, roadways and coal are not lost, the need for expensive rock tunnels and rock chutes from the tunnels to the seam above is eliminated, the pillar coal is less crushed, the roof is rendered less dangerous and less costly to support, less water enters from the surface, place is provided for refuse so that the rivers are not filled with silt and houses invaded by flood waters, air leakage is prevented, mine fires are less likely, methane and carbon dioxide are driven out of the mine, and thus much expense and danger are avoided.

In the bituminous mines of the United States the necessity for backfilling is not so obvious, for often only one bed is worked and rarely more than two. In Germany, the great number of beds in operation at one time and the great total coal thickness per acre makes backfilling more essential. It is interesting to note that mines in the anthracite region which have backfilled industriously have been able to keep in operation in competition with mines which did not backfill or did so only occasionally, suggesting that there may be compensations in the practice, particularly when instituted from the day when the mines are opened.

For cheaper methods, however, the

urge is still great, and operators have wondered if dry filling or large refuse could not be used in place of hydraulic or pneumatic stowage of fine material. In *Coal Age* of December of last year, p. 731, a machine for such a purpose was described. One in England has been constructed by the Mining Engineering Co. It has occurred to some one, however, to use a scraper for this purpose,



Layout in German Mine for Use of Scraper in Backfilling

and a description of such an application can be found in the *Demag News* of November of last year, the first unit of which was installed in the Minister Achenbach colliery in February, 1928. The general layout can be seen in the accompanying illustration.

Rock for backfilling may be brought into the workings by mine cars, shaking chutes, or belt conveyors, but in this case the transport to the longwall face is by cars alone. It will be noted that there are two tracks up to a point just

short of the car tip, it being customary in Germany to use small cars and lay all track double. This has considerable advantages and, wherever the cars are small, wide entries are not made necessary by such practice.

Dumped by a car tip, the rock runs down a chute, for the longwall face is dipping heavily. A deflecting nose on the end of the chute delivers the rock into the lane between two rows of props which parallel the longwall face. Along this lane the box scraper travels. It picks up the rock and conveys it to the pile of backfilling back of the lower end of the longwall face. An incline forms in the refuse up which the scraper travels.

In coming up to the pile the scraper has a ramming action that consolidates the waste, but the sudden stress thus laid on the rope might be disastrous to its strands, so after passing over the top of the backfilling and being directed by a snatch block along the lower entry the rope is diverted by another snatch block into a recess made in the gob, where it is passed around the pulley of a shock absorber. Then it goes to the hoist.

The tail rope is carried through a passageway left in the gob opposite the hoist and emerges in the upper roadway, where it is turned by a snatch block toward the face, another snatch block directing it down the aforesaid lane, where it connects with the hind end of the scraper. One or two men assist in piling the rock at the point of disposal, two men are used at the car tip, and one man at the hoist.

In one shift as much as 357 cu.yd. was deposited. It has been estimated that the cost of gobbing mechanically with this device is 17.4c. per cubic yard, and by hand labor is 27.5c., including all costs, such as air, amortization, interest, and the cost of making the recess for the hoist. The manual labor is charged with the amortization and interest of a longer chute with two chute motors and with the air costs for two motors.

The hoist is driven by air and is of 65-hp. capacity. The head rope is of 1-in. diameter and the tail rope of 3/4 in. The scraper has a capacity of 0.8 cu.yd. When traveling under load it travels at 6 ft. per second and when traveling back empty for a new load at 9 ft. per second or less.

Forms of coal cleaning based on external characteristics of the coal cleaned, so long used in the anthracite region and now being introduced into West Virginia, have recently been installed in England, specifically, according to Prof. R. V. Wheeler, in *Iron & Coal Trades Review*, in Leicestershire and Kent, areas which hitherto have done no cleaning. "In areas where the coals are non-coking, as in Leicestershire, Warwickshire, and Nottinghamshire, considerable attention has been devoted to the Berrisford and Etna separators for cleaning nut coal. In these appliances the raw coal is fed onto a glass plate from a fixed height. The coal bounces down the plate, while the pieces of dirt, slide, by reason of their greater 'resil-

ence' their flatter shape, and greater coefficient of friction. The glass plate terminates in a lip, beyond which is a gap across which the coal jumps, while the dirt falls through. The plate is kept free from dust by a gentle air current. The low capital cost of such

separators, their simplicity, and low power consumption have led to their adoption during the past ten years to a total capacity of 600 tons per hour."

R. Dawson Hall

On the ENGINEER'S BOOK SHELF

The Coal Industry of the World. By H. M. Hoar, Minerals Division, U. S. Department of Commerce, Washington, D. C. Trade Promotion Service, No. 105. U. S. Government Printing Office. 328 pp., 5½x9 in. Price, \$1.

A book on the coal resources of different countries has long been greatly needed, but this book makes no attempt to modify the figures given in the Twelfth International Geological Congress, held at Montreal in 1913. Since then a great war has convulsed the earth and large areas have been subdivided along new lines, adding coal supplies to some nations and withdrawing them from others, and forming new countries, some of which have large coal reserves. Since 1913, the coal fields have been further explored. Africa in particular has developed new fields. England has discovered and proved extensions and the future of Vancouver Island has been discounted. The Irish fields need an impartial assessment. Was the figure of the congress too low and was the figure of the committee appointed by the Dail too high? Consequently an entirely new survey is needed. All these things the Minerals Division has not attempted.

Perhaps nothing would have been more interesting than to learn how Ireland has been doing as a coal-producing country. Railroads have been run to tap the Leinster coal field; the Tyrone coal field has been developed. The result of these changes are of interest, but for sufficient reasons, doubtless, we learn only that the output, which in 1854 was 148,750 long tons, was in 1926 only 78,456 tons. It would be intriguing to learn what has happened in the last five years, especially in the Irish Free State.

Ireland may be divided into two parts, says the report. That north of a line from Dublin to Galway produces bituminous coal and that south of the line, semi-bituminous or anthracite—and such anthracite! The Jarrow seam, in the Leinster field, has 3.20 per cent ash and 1.45 per cent sulphur; and the Skehana seam, 3.80 per cent ash and 0.75 per cent sulphur, all seeming to confirm the British idea that anthracite is derived from a certain sort of peat of unusual purity. But when one goes into Tipperary, as when one goes into the Pennsylvania anthracite field, one finds the anthracite there is of a different kidney. In Tipperary it has 13.80 per

cent of ash and 2.11 per cent of sulphur. According to the book reviewed, in the Leinster field the Skehana seam is the one that is the more likely to be extensively developed. Its thickness is about 20 in. and its total reserve 150,000,000 tons.

The volume contains observations on merchandizing, a form of contract for the sale of Welsh coal, a glossary of trade and one of technical terms. To those expecting to compete with foreign fuel here or abroad, this book with its practical information is commended.

Handbook of Scraper Mucking, Sullivan Machinery Co. 118 pp., 8½x11 in.; paper. Price, \$2.

Scraper work has had so many interesting developments and been used under so many varied conditions that a book covering the technique of scraping will meet with a warm welcome. Especially timely is a book that brings together, as this does, the practices of various kinds of metal miners and tunnel excavators.

With this book the engineer studying to install scrapers can learn just what difficulties he will have to meet and how he may forestall them by proper planning. He gets the thoughts, schemes, designs, and devisings of many engineers, all of whom have contributed something to the art already attained. One is foolish to try to work out problems without such a guide. For some reason, longwall is overlooked in this review of the subject—a use of the scraper to which some would accord preference.

The Colliery Manager's Pocket Book, 1931. Edited by Hubert Greenwell. The Colliery Guardian Co., London, England. 465 pp., 4x6½ in. Price, 3s. 6d., cloth, England.

This little book contains an almanac, information as to stamp duties and taxes, postal information, a diary and cash account, none of which is included in the pagination. The main book contains a report of mining progress during 1930, which is mostly British and only American in so far as the U. S. Bureau of Mines reports are concerned.

It also covers statistics for Great Britain for 1929, the world's coal output, its hours of work, and the text of the

Coal Mines Act, 1930, under which the merging of mines is favored and regulated. Coal and its byproducts is treated by R. Wigginton, mine ventilation by Douglas Hay, strength of materials by J. O'Coole, and valuation, surveying, rescue and ambulance, machinery, explosives, and electricity by anonymous authors, these technical discussions absorbing 316 pages. The rest of the book gives information regarding the inspectors, coal exchanges, examinations for mine managers, surveyors, inspectors, horse inspectors, electricians, firemen, deputies, and examiners, including the questions submitted at these examinations in 1929, governmental officials, committees, mining institutes, and trade societies.

One notes with interest the fact that almost all the positions of responsibility around the mines are safeguarded by examinations.

Keystone Coal Buyers' Catalog and Mine Directory, 1931 Edition. McGraw-Hill Catalog & Directory Co., New York City. 854 pp; cloth. Price, \$15.

To those familiar with earlier editions of this work, no tub thumping is needed to sound its value. This "Blue Book" of the industry has won a sure place as the national authority on coal buying, and the 1931 edition keeps pace with its predecessors. No feature which has been justified by the experience of usage has been dropped from the new volume. As in the past, there are well-written general articles on coal classification by rank, use and qualifications for specific uses, trade names, and physical structure; exports; coal preparation, coke, low-temperature carbonization, and the composition of coal. W. D. Langtry has written a new section on sampling and analysis.

The directory of mines in each state is again prefaced by maps of the mining districts, sectional views of the coal formations, general data on the coal resources of the state, preparation, supplementary analyses, tables on ash fusibility and specific gravities, and classification of mines by seams. The directory proper has, of course, been completely revised. In addition to listing the president of each coal company, sales manager or sales agent, name of mine, shipping point, seam mined, capacity and preparation data, the new edition also carries data on operating officials, shown in recent years only in the Coal Field Directory. These data include name and address of vice-president in charge of operations, general manager, general superintendent, mining and electrical engineers, purchasing agent, store buyer, and individual mine superintendents, foremen, and electricians.

This directory section is also published separately as the McGraw-Hill Coal Mine Directory for the benefit of manufacturers and others selling to the coal-mining industry. The price of the Directory as a separate publication is \$15.

THE BOSSES TALK IT OVER



Steel Ties—

What Economies Do They Yield?

“INTERESTED in those things, are you?” inquired Mac, finding the super in his office intent on an ad dealing with steel ties.

“Very much, Mac,” returned Jim. “The Old Man wants to install them throughout the mine—with our approval, of course. He believes track could be more easily laid, maintained, and recovered; that the steel tie would have a long life and give much better track all around. Bill Jenkins told him that the Bryce mine has saved a lot of money using steel ties.”

“I’ll admit that, Jim, but what about acid water in swags?”

“I beat you to that, Mac. That’s the question. I put to the Old Man. It riled him a good deal, and he jumped all over me. He told me there was no reason to have water accumulations on the haulway; that good track and water never mix.”

“Did you ask him about the dangers of arcing and fires from imperfect bonding in track laid with steel ties?”

“No, Mac, I didn’t, because there’s nothing to that argument. You can have arcing with wood ties as well as with steel ties. Why penalize ties for faulty bonding?”

WHAT DO YOU THINK?

1. What have you saved by using steel ties?

2. Do you lay them on main haulways and why?

3. What is the life of steel ties as compared with wood ties at your mine?

4. When using steel ties what changes, if any, do you make in the methods normally followed in bonding track laid on wood ties?

All superintendents, foremen, electrical and mechanical men are urged to discuss the questions on page 258. Acceptable letters will be paid for ▶ ▶ ▶ ▶

Is it possible by taking extraordinary precautions to avoid fires in mine dumps? This is the problem Jim and Mac mulled over in April. What the readers think is told in the letters following.

Segregation of Wet Material, Proper Piling, Cut Dump Fires

OBSERVATION and experience appear to be the only guides for a mine official faced with a waste-disposal problem similar to that outlined by the Old Man, as little published material is available. The writer has inspected a number of gob piles—both burning and non-burning—to arrive at this conclusion. Observation of the piles that are not on fire shows that practically all of the material has disintegrated after a time through atmospheric action. In most cases, a year or two seems sufficient time for the shales to break up into finely divided particles, forming a layer 2 or 3 ft. deep on the outside of the pile. Thickness of the piles examined (measured vertically for the usual dump and perpendicular to the slope in the case of hillside banks) varied from a few feet to as much as 40 ft. However, for any pile that is not on fire, another very similar one will be found burning. We must, therefore, consider them all, first taking those that have caught fire.

One gob pile with which we are familiar has been in the process of building for five years. The mine was new, well-kept, and the material dumped, consisting of drawslate, overburden shales, clay-vein and bottom cuttings, and pickling-table refuse, was clean and dry. Almost no coal was carried away by either the tenants or outside persons. After the pile reached a depth of about 20 ft., the plant was shut down for three months, with the result that considerable fallen material, much of it water-soaked, accumulated inside the mine.

When operations were resumed, about 100 wagonloads of the wet material, mixed with about 200 wagonloads of dry refuse, were dumped in about three days. Thereafter, disposal of waste material continued at the normal rate of about 100 wagonloads per day. No attempt was made to separate the wet and dry materials, the dump continuing in its straightaway course. Within two weeks after operations were resumed, the point at which dumping began showed signs of heating. In a short time it was actively burning. The fire spread to the rest of the dump and it was abandoned.

At another place, great care was used to keep the dumping area as large as possible, and to allow some chance for the rock to slake, although the height

of the dump was about 18 ft. No evidence of fire was observed for about two years. One morning it was noticed that the downhill side of the dump was moving. This movement continued until the dump had slid some 40 ft. at the toe. An examination of the ground disclosed a number of small springs in the porous top rock. These evidently had been shut off by the weight of the dump, with the result that the water flowed to the surface and percolated through the dump. The pile caught fire at this point and has been burning ever since.

One more example: At a new operation the tippie was about 500 ft. from the pit mouth. Between the two was a hollow requiring a fill of about 7 ft. at the deepest point. Some water flowed out of the hillside, but as it was above the line of fill, those in charge paid no attention to it, believing that drainage across the top of the fill could be established. The entire hollow was filled with rock, slate and refuse from the development work. Before the fill was completed it caught fire. A clay barrier was required to protect the tippie.

Hence, in considering the problem of avoiding dump fires, it would appear that thought must be given not only to the material to be wasted and the method of its disposal but also to the condition of the location where the dump is to be made and to the quantity to be dumped in a given period.

As to the waste material itself, not only is the coal susceptible to spontaneous combustion but a large part of the shale also tends to catch fire. George Ashley, state geologist of Pennsylvania, several years ago made an examination of the measures above and below the Pittsburgh seam of coal and found that many of these contained a surprisingly large quantity of oil per ton. The same is no doubt true of other seams. At any rate, observation shows that all rock taken from the mines is subject to slaking. This process is a form of oxidation and involves the generation of heat. The action of coal in piles is too well known to be commented on here. Therefore it seems logical to conclude that waste material composed of various heat-generating parts must be so piled that the heat generated in the pile will be dissipated rapidly enough to keep the mass below the ignition point.

In the light of the writer's observa-

tions and experience over a period of more than 25 years, the following points stand out:

Dry materials dumped in a thoroughly drained place at a moderate rate offer the least danger of spontaneous combustion.

Dry materials dumped in an undrained place may fire even though the depth of the pile is slight.

Wet materials dumped and covered in a deep pile probably will catch fire.

Any class of gob pile so dumped as to block drainage either surface or underground, causing the water to flow through the pile, probably will catch fire.

It is not necessarily the quantity of coal in the pile which causes it to fire: it probably is due to accumulated heat given off by disintegration.

It would seem that the answer to the question of prevention of fires in gob piles is: first, insure ample drainage either through the method of building the pile or artificially; second, give careful consideration to the disposal of wet material so that water will not be sealed up within the pile; and, third, keep the depth of the pile down to a point where the heat generated will always be low.

Pittsburgh, Pa. McDONALD HILL.

Engineering Solves the Problem

ADISMAL blanket of acrid atmosphere is so typically associated with coal mines and mining camps throughout the country that we have come to believe in it as in the inevitableness of death itself. That this condition can be avoided must be answered in the affirmative, as it presents but a trifling problem compared with the magnitude and complexity of other phases of mining practice.

You may think that we have a dirt dump because we have no available space underground where we can dispose of all unmarketable bone, slate, and rock. Not at all, except in new developments. In many older properties, worked-out areas exist wherein much of this waste material could be put. But the much-thumbed cost sheet tells us that this is an expensive procedure, even where these worked-out areas are not sealed immediately after the coal is extracted. So the dirt dump on the surface, with its attendant smudge, presents the line of least resistance.

The time has long since passed since coal-mine development went hand in hand with postage-stamp-sized surface arrangements, featured by the inevitable miniature Vesuvius. Considerable areas, crossed with trestles carrying standard-gauge railroad steel, are now part of the surface arrangement at every mine.

Side-dump railroad flats are loaded about as speedily as coal is dumped into the hopper, and dinky engines shunt them to their destination. A lever is pulled and the unwanted material rolls to its last resting place with remarkable economy. Add to this a pipe line and a length of hose, and the slack pile soaked thoroughly as soon as it is dumped. Jay Brown, the engineer, has the right dope. A comparatively thin layer is dumped in one place and continued to the end of the trestle. Successive layers are put down by repeating the process. Water is added in liberal doses, solving the problem with no more ado.

Cleaning-plant reject and mine refuse are brothers under the skin, and I see little value in stacking them separately. There usually is much bone coal and pyrites in both, and the spontaneous combustion from firing of the sulphur is just as likely to happen with one as the other. A generous deluge of water will effectively discourage fire in both instances. As to whether or not it would be objectionable to allow non-employees on the dump cannot be answered off-hand by a "yes" or a "no." Like measles and mumps, the poor are always with us and the man who would peremptorily say "No!" in any and all cases would be rather less than human. The fuel may not be marketable in competition with the real thing, yet welcome and useful to the needy. On the other hand, the danger of accidents from rolling material cascading down the sides of the dump is too real to be discarded and the liability of the company cannot be overlooked. In spite of this, humanitarian ends may be fulfilled by allowing all so disposed to collect that which may fulfill their purpose after the day's hoist is over, or during the hours when the dump is not in use.

ALEXANDER BENNETT.

Panama, Ill.

Remove Coal Before Dumping

WE ARE faced with a problem similar to that which is worrying the Old Man, and it probably will cost us money in the future. Our organization is making a fill around some of the houses of a neighboring company. These were built in a low-lying bottom that is flooded by high water. After the fill is finished, we will have to take up the Old Man's problem.

To eliminate gob fires, it is necessary to keep as much coal out of the refuse as is possible. We pick out all the lump as the gob is loaded in the larry and sell it to the local trade. This helps in the disposal problem and brings in some return for the necessary labor. If there is much coal and sulphur in the refuse, water is kept away from the dump, to prevent spontaneous combustion.

Refuse should be packed in the dump as tight as possible, to exclude air which might result in firing. It is my opinion that wood will not cause a dump fire unless it is ignited by a spark from an-

other blaze. All unauthorized persons must be kept off the refuse pile. If the Old Man wants to keep a check on the condition of his gob pile, he can stand a pipe upright in the dump and place the refuse around it. The heat in the pile can then be determined by the temperature in the pipe.

Glo, Ky.

WALTER HORNSBY.

Carelessness the Biggest Danger

CURBING the natural traits of humans will go far toward preventing dump fires. Fire signs showing the damage caused by such blazes are one of the best means of doing away with careless ignition. In addition, it should ceaselessly be dinned into the ears of all that cigarette or cigar stubs and burning matches should be deposited away from the dump. Ashes left after cleaning out stoves also are a prolific cause of dump fires unless they are placed in a damp spot or care is taken to see that they contain no live coals. Non-employees should be kept off the dump, as they usually are more careless than the men on the payroll.

Stickney, W. Va.

S. J. HALL.

Flood It!

AS LONG as mine refuse with a large percentage of coal left in it is dumped in one big pile, there will continue to be dump fires. The cause may be ascribed to either spontaneous combustion or carelessness, but the fact remains that dumps do catch on fire. We have tried the spreading method, and found it one of the best—even though the dump blazed up.

In a modern cleaning plant, there should be little combustible material in the refuse. Preventive methods should start in the mine. If refuse is loaded out, coal should be removed first, or if it is allowed to remain, the waste material should be cleaned on the outside before it is dumped. Where the refuse bank is in a hollow, it seems that nature has provided a natural basin for flooding, and man can do no less than take the hint.

I would not permit anyone not an employee of the company around a refuse dump. In this state, trespassing should be discouraged on account of the insurance law, if for no other reason.

FRANK LA FOLLETTE.

Francisco, Ind.

An Answer to High Costs

AS IDEAL conditions are seldom found in all parts of a coal mine, it is difficult to set a definite time limit on day-work jobs. Adoption of a time limit will affect the quality of the work done, cause equipment to be poorly repaired, and, in all probability, increase accidents.

The best way to get efficiency from

day men is to lay off the mine in small sections, each supervised by a competent foreman. Authorize him to select his men and allow him to plan ahead for the development of his section, so that when a certain job is to be done he will be prepared for it in advance. In my district there are mines that employ this system, with a day-labor cost and freedom from accidents which Jim's plan would find difficult to match.

Paintsville, Ky.

W. M. BURGESS.

Average Foreman Is Picked For All-Around Knowledge

MAC is right; day work does get more supervision than any other class of labor in the mines. Likewise, Jim is right when he asserts that it is not so much a question of how much supervision, but how intelligent. The correct answer to the problem, therefore, is a composite of the two views: intelligent supervision plus cooperation.

Complete mastery of all phases of mine operation would require two lifetimes, at least. Certainly, specialized supervision in mining would give better results. But the average foreman is not picked for his expertness in a few phases, but for his general all-around knowledge of mining. Many assistant foremen, when they have reached this point, feel they have reached stardom and from then on take themselves too seriously. In consequence, they feel little disposed to cooperate with those under them. There lies their failings, for in the ranks of workers are many many men as able as themselves, of a more cooperative disposition, and therein is a clue to the solution of the problem. Incidentally, how long would an assistant foreman last if he failed to cooperate with his superior officials?

To supervise certain lines of day work through special foremen, is hardly practicable in scattered workings. In centralized workings, no doubt, special day work foremen would succeed. But why is it not better to assign each assistant foreman a definite territory, perhaps smaller than customary, and make him fully accountable for the activities within it?

Trackwork, timbering, and motor haulage are—or should be—a part of the knowledge of every good assistant foreman, as well as the more direct face activities in the mining of coal. With this knowledge as a background, intelligence would come into its own. It would be manifested by pre-arrangement of all work, including pre-delivery of all supplies, where and when needed, strict adherence to the plan of development, and all-around planning. Delays and breakdowns should be studied and their causes isolated.

It is only logical for the workers to think that when one of them is selected as an assistant foreman there remain others as competent. They expect the new assistant foreman to cooperate with them. Perhaps too often the fore-

The BOSSES Talk It Over

men and the higher officials look on co-operation only as working from the bottom up, forgetting that it can work from the top down, as well. Pride should be instilled in the workers, which means that they should be given some responsibility and not be treated as mere automats who are to be pushed and guided according to the whims of the foremen.

FRANK STANK.

Taylor Springs, Ill.

Preparation Before Performance

IN COAL mining, labor generally is the greatest item of cost. Inefficiency in its use may be due either to natural conditions or to bad management, but an inside foreman should be able to perform any job in the mine from trapper boy up. By having such experience beforehand, he will be able to handle the job of mine foreman when he lands it.

One of the best ways to conserve day labor is to prepare for a job so that it can be done with the greatest possible dispatch. If a trackman or timberman must spend half the day hunting for material or removing refuse before he can go to work, the hours so spent are largely wasted. The foreman should plan such jobs in advance, so that the material will be on the spot and a laborer provided for cleaning up.

Inside labor can be standardized to some extent by adhering to these principles. In most mines, a regular force of three men should be able to keep up the heavy steel on the main haulageways and look after loose bolts, low joints,

and bad ties. The rest of the day force can then devote its time to maintenance of aircourses, drainageways, and manways, or in laying curves at the face and recovering or moving material.

Smithfield, Pa. F. O. NICHOLS.

Supervision Means Efficiency

IT IS true that day men get more supervision than men at the face, but the supervision does not go far enough in that it usually consist only of instructions on what to do and where to do it. The problem of how to do it in the most efficient manner and at the smallest possible cost is one that should receive the consideration of everyone in charge of day men. Knowing how to do it will obviate the necessity of setting time limits on certain jobs, which, to say the least, is poor practice and conducive to hasty and inefficient work.

A squad foreman should be employed in each section of the mine and his only job should be to supervise the work of a group of day men. More than once has a mine foreman sent a group of men to do a certain job only to find upon inspection after completion that it had to be done over again or left as it was at the cost of over-all mine efficiency. Closer supervision by the squad foreman and the additional time spent with the men by the mine foreman at the face will result in a greater over-all plant efficiency.

FENO CASTELLANI.

Manhattan, Kan.

fine their remarks to the foreman in charge. They are not underground to boss the mine but to keep in such close touch with actual operations that they know at all times how and where money is being spent. Under this plan there is very little guessing; the foreman gets what he needs and uses wisely what he gets. The general foreman or foremen take charge of general supervision and ventilation, doing all their business with the face bosses, haulage boss, and track foreman. All instructions are directed to these men instead of to the individual workman.

All men working in or coming into a section come under the immediate supervision of the face boss as soon as they enter his section. The haulage crews are under the haulage boss, who directs all work pertaining to haulage, including, phone, light, and signal systems. He also directs the main-line track crew. Each face boss and other separate departments have a tool house or large tool box. All tools are checked out and back each day. When two or more men are sent to do a certain piece of work one of them is placed in charge and the boss holds him responsible. From these leaders the company gets its key men and bosses. The master mechanic has charge of everything mechanical and electrical, including pipemen, bondmen, and wiremen. In this company's operations, things are done with very little bluster and squabbling and the heavens are not blamed for every little failure of the day.

G. E. DAUGHERTY.

Paintsville, Ky.

Trade Literature

Welding Handbook. American Steel & Wire Co., New York City—Pp. 32, illustrated. Covers electric arc welding and gas welding and describes the demands placed upon welding wire.

Electrical Equipment. General Electric Co., Schenectady, N. Y., has issued the following: Synchronous Motors for Pumping, GEA-1152A; Direct-Current Crane and Hoist Motors, GEA-38B; Fractional Horsepower Motors and Motor Parts, for alternating and direct-current operation, GEA-1,277; General-Purpose Squirrel-Cage Induction Motors, GEA-1,303A.

Electrical Equipment. "Sullite" Portable Electric Plants. Sullivan Machinery Co., Chicago—Bulletin No. 100-B; 8 pp., illustrated. Construction features and specifications for different models and sizes are covered.

Shovels. 100-B 3-Yard Electric or Steam Revolving Shovel. Bucyrus-Erie Co., South Milwaukee, Wis. Bulletin No. D-1006; 24 pp., illustrated. The use of this machine for heavy digging is described; complete specifications are included.

Steam Equipment. "A Pioneer in High-Pressure Steam" is the title of a 16-pp. illustrated bulletin issued by the De Laval Steam Turbine Co., Trenton, N. J. Reviews the early work of Dr. De Laval.

Shovels. 1030 3-Yard Convertible Machine—Bucyrus-Erie Co., South Milwaukee, Wis. Bulletin No. FBE-10,301; 20 pp., illustrated. Describes this machine, which combines clamshell, lifting crane shovel, dragline, drag shovel.

Sheet Metals. "Armco Ingot Iron Saves Money in the Coal Industry" is the title of an 11-pp. illustrated booklet issued by the American Rolling Mill Co., Middletown, Ohio. Outlines the uses for sheet metal and discusses the various conditions that it is called upon to meet.

Time Has Proved This Plan

CONTROLLING day work is not so much a matter of having too many day men as it is of keeping the men you have gainfully employed in doing eight hours' work for eight hours' pay. The fact that a miner is supposed to work eight hours is well understood, but in the average mine the efficiency never gets far above 50 per cent. Part of the blame can be laid on the workman, but the greater burden rightfully belongs to the management. There is too much of "Where is the motor?" "Oh, off the track somewhere I guess." "Did you call the side track?" "Nah, that phone hasn't worked for two weeks." "What are you doing, Bill? Waiting on the rail bender? Someone took ours"; and so on and on. If a banker were boss he probably would figure something like this: "I have a hundred company men, losing a hundred minutes each day at a penny a minute. Six hundred thousand dollars must be invested at 6 per cent to earn the money paid these men for the time they waste."

A leading coal company approaches the problem in this way:

The superintendent or his assistant stays in the mine most of the time. They visit the working places, but con-

Publications Received

Requests for U. S. Bureau of Mines publications should be sent to Superintendent of Documents, Government Printing Office, Washington, D. C., accompanied by cash or money order; stamps and personal checks not accepted.

A.S.T.M. Tentative Standards, 1930. 864 pp., illustrated. Price, \$7 in paper; \$8 in cloth. Contains 155 tentative standards, 25 of which relate to coal and coke, shipping containers, slate, and miscellaneous materials. American Society for Testing Materials, Philadelphia, Pa.

Research Needs of Illinois Coal Industry. Engineering Experiment Station, University of Illinois, Urbana, Ill. Bulletin 33; 89 pp., illustrated. A symposium relating to recovery, preparation, marketing practice, utilization, and basic research presented at Quarter Centennial Celebration of Illinois State Geological Survey, April 30, 1930.

Permissible Electric Mine Lamps, by L. C. Ilsley and A. B. Hooker. Bureau of Mines, Washington, D. C. Bulletin 332; 39 pp., illustrated.

Hauling Coal Safely With Permissible Storage Battery Locomotives, by C. W. Owings. Bureau of Mines, Washington, D. C. R. I. 3,051; 18 pp., tables.

Accident Prevention in Coal Mining, by W. H. Forbes. Bureau of Mines, Washington, D. C. I. C. 6,409; 5 pp.

OPERATING IDEAS

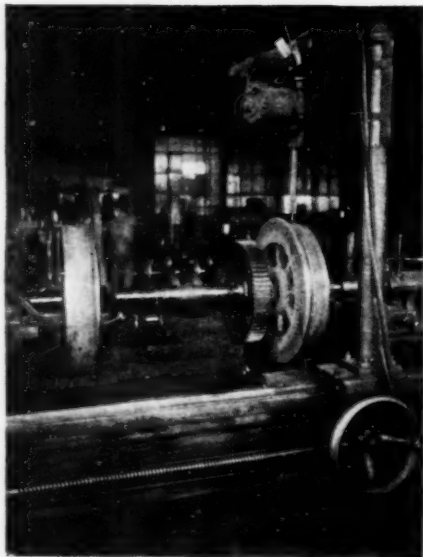
From PRODUCTION, ELECTRICAL And MECHANICAL MEN

Attractive Maintenance Saving Effectuated By Automatic Tire Filling

VERY few companies have found it profitable to fill mine locomotive tires by hand-operated electric welding. One of the exceptions is the Clearfield Bituminous Coal Corp., Indiana, Pa., which followed the practice continuously for nine years. Beginning in March, 1930, however, hand operation for tire filling and building up axles and shafts was thrown into the discard by the purchase of an automatic welding head and control equipment. This machine turns out a more satisfactory job and effects an enormous saving over the hand method.

Fig. 1 shows the welding head in position ready to strike the arc and fill a worn tire of a truck that is mounted in the lathe. This head, a Westinghouse product, consists essentially of a motor-driven roller feed for handling the continuous wire electrode. Mounted on a wall near by is a control box containing a small motor generator and several re-

Fig. 1—Adjusted and Ready to Strike the Arc When the Operative Pushes a Button



lays. In addition, the automatic equipment includes another rather small motor generator which would have been unnecessary if direct current of 60 to 300 volts had been available at the Clymer shop, where the welding is done. The equipment above enumerated is required in addition to the regular motor-generator set for supplying the main welding current. The automatic equipment, exclusive of the second small motor-generator, cost approximately \$1,000.

As shown in Fig. 1, the welding head is rigidly clamped to an adjustable standard carried by the lathe carriage. The carriage feed is set for four threads per inch and the lathe is driven at a peripheral speed of 9 to 10 in. per minute at the tire tread. Fig. 2 shows the welder at work. This is not a normal set-up, however, because at the time the picture was taken, the protective asbestos curtain had been removed to permit photographing the welder in action. Fig. 3 shows the entire lathe with the curtain box in normal position over the welding head and tire. Built into the curtain there is a colored glass window for viewing the arc.

The lathe was fitted for the extremely low speed by connecting the 15 hp. variable-speed motor through a silent chain and a spur gear reduction. A small control panel by which the operative starts and stops the arc and controls the welding head when making a set-up is mounted on the lathe gear box. The welding wire, as it comes from a 100-lb. roll on the floor and threads up over a traveling sheave, can be seen at the top of the illustration.

The filled tire, Fig. 4, is typical of the smooth job that is done. Even the flange has been built up to approach closely the original contour. With hand welding, building of flanges was impracticable. It is the practice to grind the filled surface slightly after welding. Only



the high spots are taken off and there is no attempt to grind to the bottom of the ridges between beads. The company uses a few plain tires (the type without flanges), and on these, grinding after filling is not considered necessary.

Before the automatic welding head was purchased, the electric welding machine at the Clymer shops was operated two shifts in order to handle tire filling and other repair work. Now all of the work is done easily in one shift. Hand operation continues to be used for jobs which cannot be welded during rotation in a lathe. While tires are being welded the operative spends most of his time doing machine work at another lathe or at other jobs which he can leave conveniently once in a while to supervise the automatic welding. Thus the tire-

Fig. 2—Normal Operation Except That the Asbestos Arc Shield Has Been Removed to Allow Photographing



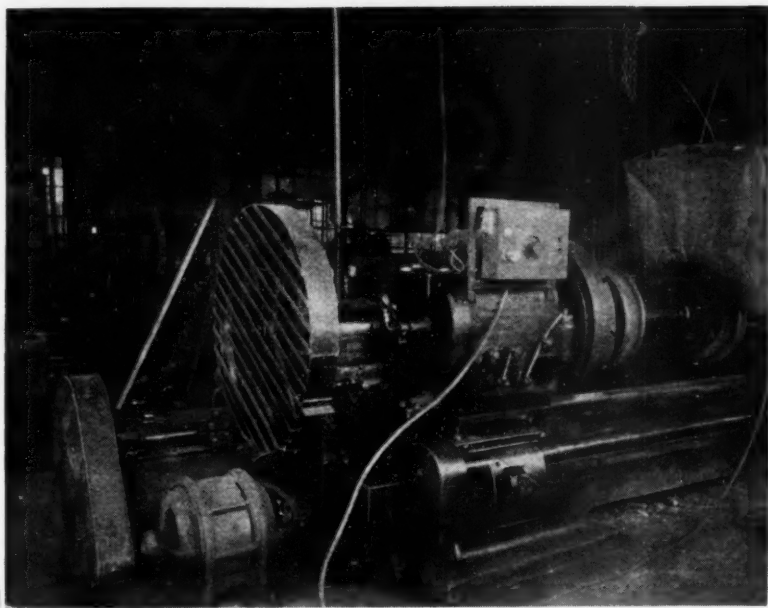


Fig. 3—Lathe Specially Fitted for Tire Welding and Arc Shield in Place Over Welding Head

filling labor cost is very small. Ten to 12 hours was the average time for welding a tire by hand, and in certain cases 36 hours was required. Five hours is the average time for automatic filling.

It is figured that the welding cost averages approximately \$20 per set of four tires. New tires of the 25-in. flanged size cost approximately \$95 per set and the 31-in. size approximately \$200 per set. The welded tires wear but little faster than new tires. There seems to be no limit to the number of times that a tire can be filled or built up. No record has been kept, except that it is definitely known that at least one set has been filled five times.

Uncoated high-carbon electrode wire of $\frac{1}{4}$ -in. diameter is used in the automatic machine for building tires and axles. The cost is about 7c per pound and there is no waste, as there is in

hand welding. On shafts as small as 2-in., wire of $\frac{3}{16}$ -in. diameter is used for the automatic filling, and the peripheral speed is increased to 12 in. per minute. For hand welding on small shafts that are to be threaded, Wilson No. 9 coated electrode is used.

One of the advantages of tire filling is the lack of necessity for removing the tire from the wheel center. This

adds appreciably to the labor saving and eliminates a job which if done indoors usually results in disagreeable smoke or gas.

Breakage due to electric welding is one of the reasons why tire filling has not gained more ground. Welding experience of the Clearfield Bituminous Coal Corporation includes many broken tires, but in most instances the tires broke just as the welding was completed or before the tires went into service. Automatic welding, because of the lesser heat concentration causes less breakage than did hand welding. In but few instances during all the years of welding have tires broken while in service and in no case has the tire come off of the center and caused an accident. Even with the less certain method of hand filling the company has experienced periods of as much as a year without a tire break.

It has been concluded that with automatic welding there is no danger of tire breakage unless the tire was put on too tightly in the first place. One case was experienced of a brand new tire, that had never been welded, breaking into eight pieces as it was shrunk onto the wheel center. Proper fit of new tires is now given close attention. It has been found that in most cases undue tightness is caused by ridges being left when the tires were bored. It is not uncommon to find a ridge next to the shoulder.

In the purchase of tires the usual shrinkages are specified but the tolerance is small. Sometimes it is found necessary to rebore a new tire at the Clymer shop before installing it. Tires to fit on wheel centers of 20.5 in. diameter are bored to 20.478 in., a shrinkage allowance of 0.022 in. The shrinkage allowance for a 5-in. tire $2\frac{1}{4}$ in. thick to fit on a center $26\frac{9}{16}$ in. in diameter is 0.026 in.

T. F. McCarthy, formerly electrical engineer and now assistant general superintendent, who has paid close attention to tire welding for many years, feels that there is no question as to its practicability and is certain that the automatic welding head paid for itself in less than a year. J. W. Harvey, shop superintendent and equipment inspector, considers that there is practically no risk involved if new wheel centers are applied with the proper shrinkage limit.



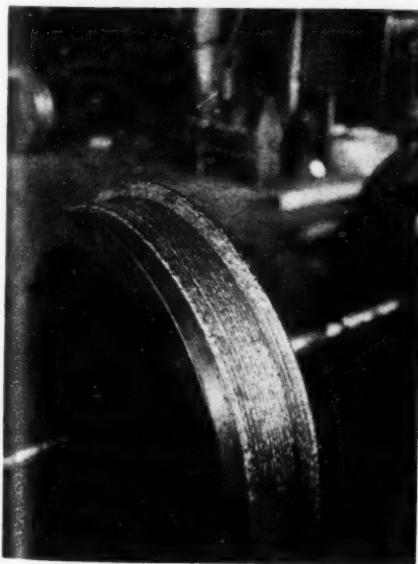
Motor Hung on Tight Wire For Safety

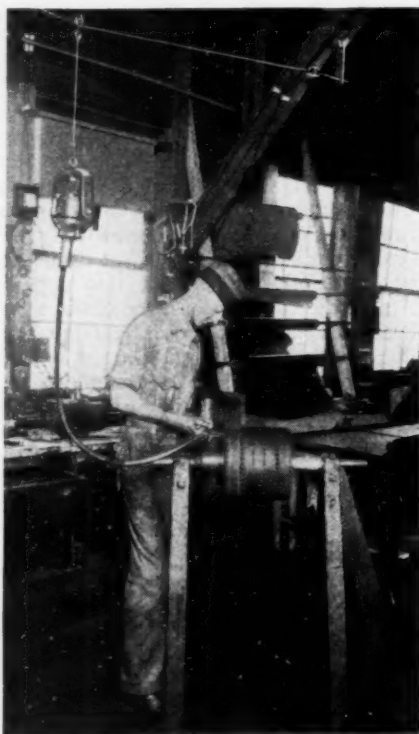
For some time after the purchase of a motor and flexible shaft equipment for grinding armature laminations and slotting commutators in the Coalwood (W. Va.) shop of the Consolidation Coal Co. it was the practice to place the motor on the work bench while working the tool on armatures, which, accordingly, had to be brought close to the bench. This method did not provide the desired flexibility; moreover, the

Mutual Assistance

Many ways of meeting the competition of rival fuels have been suggested. One of the best is by improving the technique of the industry, and it is to this end that this section of *Coal Age* is devoted. Every mine is an experiment station, a research laboratory, where new ideas are evolved and new methods put in operation. An industry progresses and meets competition by perfecting its technique—its ways of doing things, in other words. You have some ideas and experience in this direction. We invite you to send them in as a contribution to industrial progress. We will pay \$5, or more, for each article suited to this department when accepted.

Fig. 4—A Smooth Job of Building Up Tread and Flange





Handy Position for the Motor While Slotting a Commutator

motor had a tendency to work to the edge of the bench and fall off, which, of course, was a hazard to the feet of the workman.

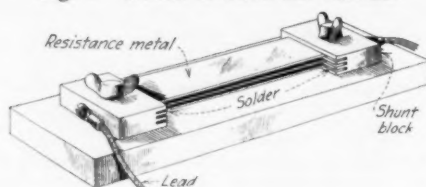
The illustration shows the more convenient and safer method now used. Trunnion bolts were welded to the sides of the motor frame and a yoke attached. The yoke is supported from a pulley which runs on a tight messenger wire overhead.

Taking Care of Portable Ammeter and Shunts

A recently published operating item entitled "When Portable Ammeter Shunts Cause Trouble," by David Williams, of Youngstown, Ohio (*Coal Age*, Vol. 36, p. 150), gave tips on the care and use of testing equipment. To what Mr. Williams remarked on the subject, Chas. H. Willey, Concord, N. H., adds the following:

Most test shunts are made up of strips or leafs of Gilby metal or german silver. These strips are soldered into slotted brass or copper shunt blocks, as shown in Fig. 1. In service tests under a load of too long duration or under overload, the shunt may become heated

Fig. 1—Where to Look for Trouble



and melt the solder a little. The result is a damaged shunt, which will make the meter reading high. One should examine the shunt before making tests and see that this solder is well amalgamated to the block. If it must be soldered, be careful not to get solder on the surface of the resistance metal, for

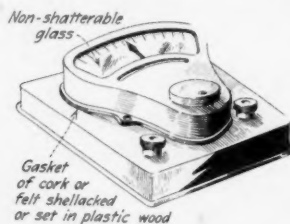


Fig. 2—Keep the Ammeter Dustproof

this will change the drop of the shunt. If in doubt, send the shunt and the meter back to the factory and have them tested and checked for calibration and readings.

Take good care of the portable test ammeter. Put in a glass of the latest non-shatterable type, and seal the cover with plastic wood or cork-shellac gaskets to keep out the coal dust. Make a carrying case, and remember always to keep the same size and length of leads to the shunt, for these are originally tested for drop and are fitted to the particular meter and shunt.

Getting the Most Life From Belts

That a belt conveyor is correctly installed is no guarantee it will function indefinitely without attention. When trouble arises there is a reason and usually it is definitely founded. W. E. Philips, Link-Belt engineer, points out a number of the causes of trouble and their correction:

Lubricate intelligently. Keep the space under the belt clear and remove overflow material from the deck, for otherwise clogging of the idlers will follow, resulting in greater power consumption and increasing the wear and tear on the entire installation. Belts and idlers are designed for a fixed maximum load. To overload is to punish the unit. Material should be fed to the belt with slight impact and in the direction of belt travel. Premature wear on belts is caused by scraping against framework, wedging of the material handled, and dragging idlers.

Train the belt while it is empty. If it runs out of line when loaded, then loading is not uniform. The trouble cannot be corrected by adjusting the take-ups. Look to the feed end; perhaps a feeder is needed. See that the belt contacts the center roll of the idler, because this roll steers the belt. Do not use side or guide idlers to train the belt and do not attempt to train the belt by increasing the tension. Belt injury beyond remedy will be the result.

Rail Treadle Counts Cars Passing Along Track

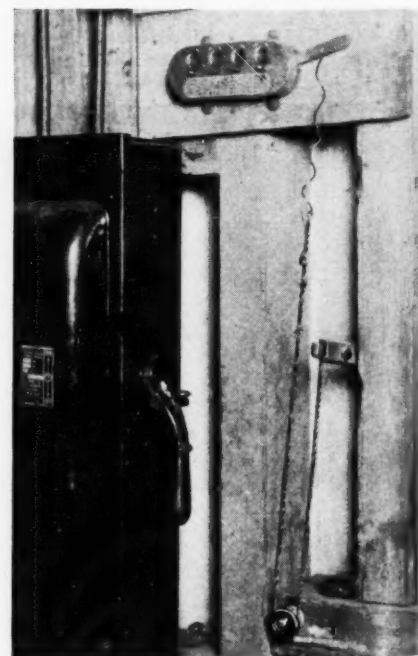
An outside haul of several miles separates the top of the slope and the tippie at the Auxier (Ky.) operation of the North East Coal Co. Under these circumstances, it is desirable, from the standpoint of the mine foreman, that the cars be counted as they are hoisted at the slope rather than as dumped at the tippie. Counters located in the hoist



Treadle on Near Track Counts Coal Cars and One on Far Track Counts Slate

house automatically total the number of cars of coal and of slate separately as these cars pass by the hoist house on their respective tracks.

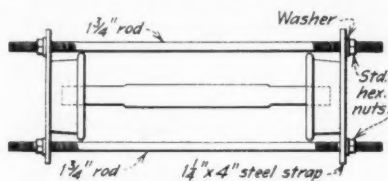
Coal Car Counter on Inside Wall of Hoist House



The counters are actuated through the medium of wire ropes held taut by springs and connected to treadles mounted beside the rails. The treadle is long enough to span the wheel-center distance, so that the passage of a car causes the treadle to be depressed but once. Parallel links support the treadle. To be depressed the treadle must at the same time move endwise, which motion pulls on the wire rope and advances the counter. A spring at the other end of the wire rope raises the treadle to normal position. By means of a lever, a short length of cord, and a small spring the motion of the wire cable is transmitted through the wall of the hoist house and to the lever of the counter.

Wheels Fitted Tight on Axle With Screw-Rod Press

Generally, only the largest mines are equipped with a hydraulic press, yet there are times at every operation when the need for it or some similar device is felt. To ship wheels and axles long distances by motor trucks for fitting in a completely equipped machine shop is expensive both in the matter of actual cost and in delays to operation. Par-



When a Hydraulic Press Is Not Available, Use This

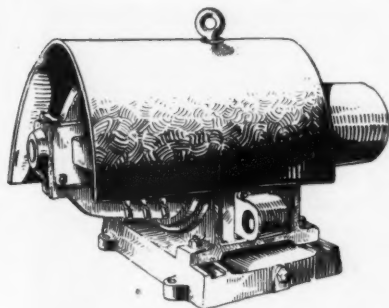
ticularly is this true in the case of an isolated plant in mountainous regions.

E. M. Snow, master mechanic, Gulf States Fuel Co., Shannon, Ala., when recently confronted with this problem resorted to the use of a screw-rod press which he devised for the job. With it he was successful in pressing a set of wheels on an axle to make a pair of trucks for a 10-ton skip. The press itself is shown in the accompanying sketch. Variation in the size of the parts used may be made, depending on the pressure it is desired to exert.

Half Barrel Protects Motor From Roof Drip

Although the general trend is toward modernization, quite a number of mining properties continue to use open-type motors underground. As these motors frequently are subjected to wetting by water dripping from the roof, burnouts are the result. The accompanying illustration, submitted by Thomas James, superintendent, No. 3 Mine, Knox Consolidated Coal Co., Vincennes, Ind., shows how this trouble can be avoided.

With a blowtorch, cut a grease barrel lengthwise in two, and remove the ends.



A Way to Avoid Burnouts in Open Motors in Mine

If no torch is available, the job can be done with hammer and chisel. The job is finished by cutting a hole in the shield to pass over the eyebolt on top of the motor. A rubber gasket and a washer at this hole make the motor drip-proof. A barrel of average size will yield a shield to cover a motor as large as 20 hp.

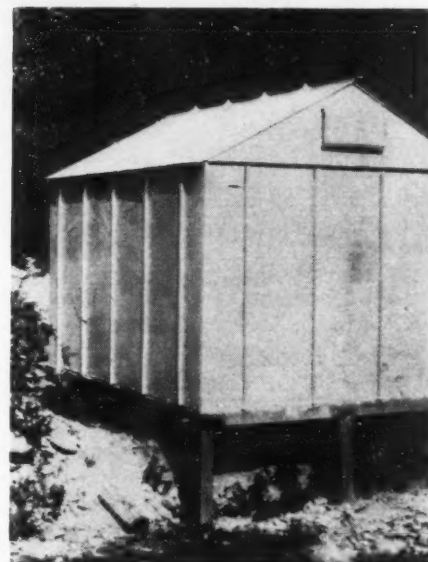
Paint Keeps Magazine Cool In Hot Weather

High temperatures have a deleterious effect on explosives, the only exception perhaps being the blasting cap. Especially is this true when the temperature is alternately high and low, as in regions where the days are hot and the nights cool. Overheating is accentuated by the use of iron in the construction of magazines. The iron absorbs and holds the heat from the sun to a greater degree than either concrete or wood.

Yet the utilization of iron in magazine construction is not unusual in coal mining, its adoption being governed usually by convenience of assembly and low cost. It is important, where this type of construction has been accepted, that provision be made to guard against excessive high temperatures within the magazine in summer months.

In the February *Du Pont Explosives*

Service Bulletin is described an experiment in which temperature studies were made for comparison purposes inside and outside two explosives magazines constructed of iron, under identical conditions. One of these was covered with aluminum paint and the other with black



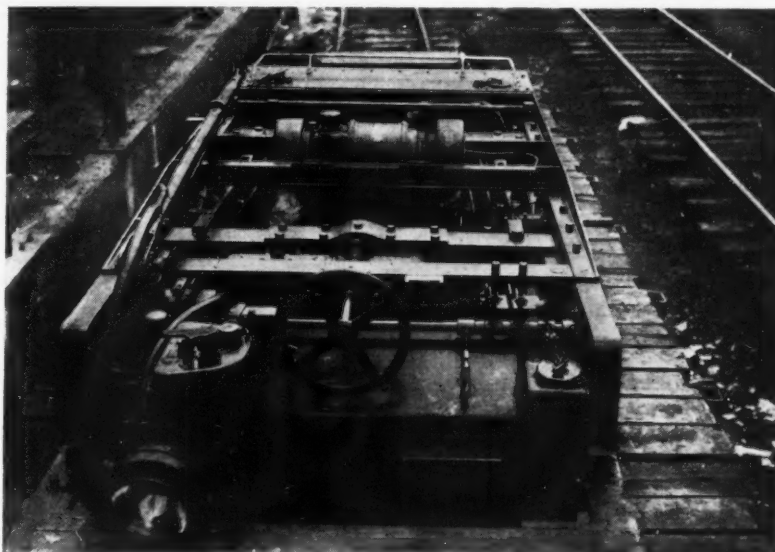
Aluminum Paint Reflects Heat of the Sun

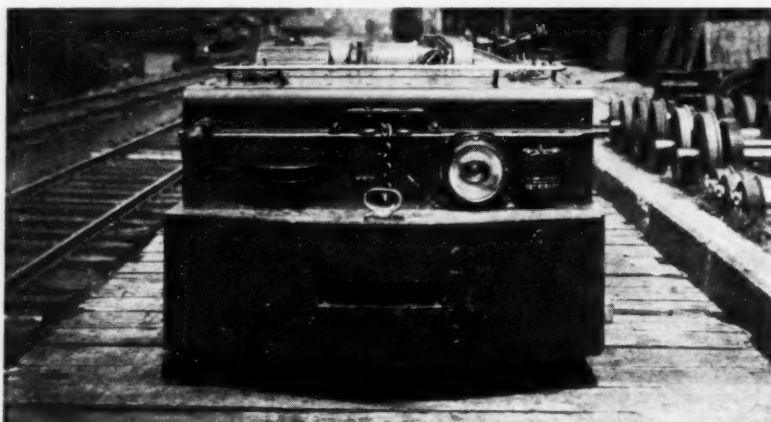
paint. It was found that during the heat of a July day, with outside temperature ranging from 106 to 108 deg. F. in sunlight and 94 deg. in the shade, the temperature in the aluminum-painted magazine remained 14 deg. lower than the temperature in the magazine painted black.

Blowers Added to Reduce Maintenance Cost

Windings of locomotive motors can be asbestos-insulated to withstand rather high temperatures, but these temperatures cause lubrication trouble in ball

Showing the Blower Unit and Tubing





The Blowers Draw Air Through Perforated Guards on Two of the Locomotives

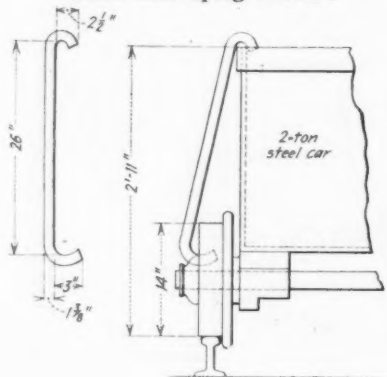
bearings, according to service records at mines of the Consolidation Coal Co. At the Jenkins (Ky.) shop of the Elkhorn division, blowers have been added to the motors of six 10-ton locomotives which have been in service for 10 to 15 years and which are on a duty cycle that causes excessive temperatures.

The blowing unit for each locomotive consists of a 6-hp. 2,700 r.p.m. General Electric 275-volt motor with a No. 1 Sirocco blower on each end of the shaft. A canvas tube from each blower conducts the air to a hole in the motor case opposite the commutator, and the air passes out through a hole at the bottom. Including the cross members supporting the unit, the total added weight is approximately 350 lb. Perforated screens of heavy metal cover the blower intakes. The first installation of a blower was made in January of this year.

Hang-Hook Safety Sprag Saves Fingers

One source of accidents that give operating officials considerable worry lies in the spragging of cars while they are in motion. Mashed hands and fingers, sometimes more serious injury, are the result of using the usual types of sprags for slowing down a trip. It was with the elimination of these dangers in mind that J. W. Hawkins,

The Hand Is Not Exposed to Injury When This Sprag Is Used

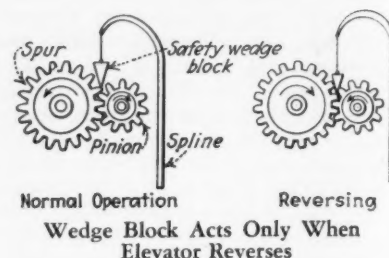


mine foreman, Gulf States Steel Co., at Shannon, Ala., conceived the idea of the hang-hook safety sprag, details of which have been furnished by R. C. Montgomery, division engineer.

As the accompanying sketch gives all the pertinent data on the design of this sprag and also illustrates its use, a description is not necessary. It is said that a man may apply this sprag to a car or trip running at fairly high speed without the risk of injuring either fingers or hand. He holds the sprag near the center, hangs the top hook over the side of the car, and merely drops the lower hook into the wheel. Incidentally, this sprag is used also for holding cars at the working faces.

Bucket Elevator Is Protected

At Midvalley Colliery of the Hazle Brook Coal Co. there is but one bucket elevator which carries the coal from the bone rolls, that from the lip screens and the condemned coal to the top of the breaker. If anything should cause the top sprocket to reverse, such as the



breakage of a chain, a wedge block suspended by a spline so as to engage the teeth of the spur gear is drawn into the gear till it effectually jams the teeth. When the wheels travel normally they continuously push the block out of the way, but the moment the two spurs reverse, the block is drawn in and prevents further motion.

Hand Card Arrests Attention

Believing that safety signs cannot be relied upon solely for calling attention to safety messages, the Glogora Coal Co., Glo, Ky., is using small handcards as a further means of conveying thoughts of safety to its workers. A reproduction of this card is seen in the accompanying illustration. An adequate supply of these cards is kept on hand at all times; they have been distributed to all men at the plant; every new man gets one; and in the event it appears that any worker has failed to live up to the suggestions, he is given another card. In handing out the card to the worker, the boss admonishes that careful consideration be given the advice and rules. The expense of having a card of this sort printed is a small item.

According to Walter Hornsby, these cards command more attention than safety signs, at least while they are in the stage of being a novelty. The line "Suggestions to improve safety are welcome" is said to have influenced a number of workers to contribute their ideas.

This Card Cautions Each Man Individually

- Stay in your own working place.
- Avoid abandoned workings.
- Follow instructions of the foreman.
- Examine your place before beginning work.
- Timber your place whether it needs it or not.
- Your own future and your family's happiness is at stake.
- Failure to be careful may mean an accident.
- Insist on your "Buddy" being careful.
- Report any unsafe conditions to the mine foreman.
- Suggestions to improve safety are welcomed.
- Take no chances.

WORD from the FIELD



Pulverized Coal Sold in Iowa For Domestic Use

Pulverized coal for domestic use is being produced and distributed by the Automatic Coal Co., Sioux City, Iowa, in a form comparable to fuel oil and natural gas. Twenty-one customers were served by the company during the past heating season. Southern Illinois coal was used exclusively.

The finished product, delivered in tank wagons, was sold on a gallon basis, and was burned in an ordinary furnace or retort. The company obtained between 10 and 15c. a gallon for the coal. On this basis, the coal was sold at \$15@18 a ton, making the profit approximately \$5 a ton. Consumers said that fuel consumption was less than in either hand-fired or stoker-operated plants, and that efficiency and economy were substantially higher.

Rocky Mountain Institute Meet To Be Held in June

Coal-mining methods, design of equipment, safety, cost-accounting, coke, preparation, domestic stokers, mechanical loading, and welding practice will be discussed at the annual meeting of the Rocky Mountain Coal Mining Institute, to be held at Denver, Colo., June 3-5. Fifteen speakers will deliver thirteen papers at the technical sessions, as follows:

"Driving a Rock Tunnel With Duck-bills," C. E. Swann, chief engineer, and Thomas Foster, superintendent, Union Pacific Coal Co., Rock Springs, Wyo., and W. D. Bryson, general superintendent, Colony Coal Co., Dines, Wyo.; "Safety Practice to Eliminate Accidents," Robert Williams, Jr., superintendent, Calumet Fuel Co., Somerset, Colo.; "Cost Accounting for Coal Mines," J. A. Bullington, Colorado Fuel & Iron Co., Pueblo, Colo.; "The Status of Coal," C. B. Huntress, executive secretary, National Coal Association, Washington, D. C.; "Coal Mining and Savings to Be Effectuated by Safety Work," C. A. Herbert, U. S. Bureau of Mines, Denver; "Safety Locomotives," J. N. Rosholt, Electric Storage Battery Co., Denver; "Foundry Coke," C. B. Carpenter, Colorado School of Mines, Golden, Colo.; "A Modern Tipple," J. W. Wilson, Link-Belt Co., Chicago; "Domestic Stokers," A. W. Hanson, Colorado & Utah Coal Co.,

Business Continues to Lag

"The slight spring stimulus seems to have spent its force by the latter part of March and business has been backsliding since," says *The Business Week* of April 29. "Our index has steadily declined during the past five weeks till, at 77.7 per cent of normal, it is nearly back to the December low. Security markets have steadily followed suit and commodity prices continue their relentless movement toward inconceivably low levels. Seasonal building improvement seems to be weakening again, but carloadings begin to show a bit more than seasonal recovery. Hope of reversal of the downward drift of steel production by May persists under expectation of larger structural and pipe-line demand, but the marked increase in automotive requirements becomes doubtful.

"It now appears likely that the first-quarter business improvement was only a bump on the bottom, and not the definite beginning of a recovery. The foreign scene has become clouded again, and Governor Norman's mission has apparently meant nothing more than further futile effort to force short-term money rates lower in hope of melting frozen long-term investment bonds. Our idle gold hoard piles up without increasing the means of payment by credit expansion because of paralysis of banking policy, thus prolonging price deflation, impoverishing ourselves as well as the world, and making poor old Midas appear a piker by comparison."

Denver; "Producing Coal Safely," Thomas G. Fear, general manager, Consolidation Coal Co., Fairmont, W. Va.; "Welding," George N. Robinson, engineer, General Electric Co., Denver; "Mechanical Loading in Southern Colorado," Frank R. Wood, president, Temple Fuel Co., Trinidad, Colo.; and "Mine Cars," Huston H. Watt, vice-president, Watt Car & Wheel Co., Barnesville, Ohio.

New Plant Construction

New contracts for topworks and construction under way or completed at various coal operations reported for the month of April are as follows:

CONSOLIDATION COAL Co., Mine 32, Owings, W. Va.; vibrating screen plant to separate slack coal into pea and small slack completed by the Fairmont Mining Machinery Co. The installation, which has a capacity of 200 tons per hour, includes conveying equipment, bins, and crusher to break down lump and egg.

CONSOLIDATION COAL Co., Mine 93, Byrne, W. Va.; contract closed with the Fairmont Mining Machinery Co. for vibrating screen plant to separate slack into pea and small slack. Capacity of the installation is 160 tons per hour and it includes conveying equipment, bins, and crusher for breaking down lump and egg.

KINGSTON POCAHONTAS COAL Co., Springton, W. Va.; contract closed with Roberts & Schaefer Co. for Menzies hydroseparator equipment for washing and sizing pea and stove coal; capacity, 150 tons per hour; to be ready July 1.

LILLYBROOK COAL Co., Lillybrook, W. Va.; contract closed with the Kanawha Mfg. Co. for shaker screen equipment, consisting of shaker screen unit, slack hopper, bar screen, and auxiliaries; capacity, 300 tons per hour; to be completed about June 1.

MIDLAND ELECTRIC COAL CORPORATION, Atkinson, Ill.; contract closed with the Pittsburg Boiler & Machine Co. for Pittsburg-Montgomery coal washing equipment; capacity 315 tons per hour of 3 in. to 0 coal; to be completed July 15.

MALLORY COAL Co., Mine No. 3, Mallory, W. Va.; contract closed with Roberts & Schaefer Co. for Menzies hydroseparator equipment for washing and sizing pea and stove coal; capacity, 50 tons per hour; to be completed June 1.

MALLORY COAL Co., Mine No. 2, Landville, W. Va.; contract closed with Roberts & Schaefer Co. for Menzies hydroseparator equipment for washing and sizing pea and stove coal; capacity, 50 tons per hour; to be completed June 1.

WESTMORELAND COAL Co., Irwin, Pa.; contract closed with Roberts & Schaefer Co. for complete Menzies hydroseparator coal-washing and screening plant to be erected at Hutchinson mine; capacity, 300 tons per hour of 3-in. screenings; to be completed Sept. 1.

Natural-Resource Industries Discuss Legal Bars to Stabilization

BRIGHT LIGHT on the twilight shadows cast upon concerted intra-industry action by federal anti-trust statutes was demanded at a round-table discussion of production problems of coal, oil, and lumber held by the natural resources production department of the Chamber of Commerce of the United States at the Ambassador Hotel, Atlantic City, N. J., April 29, in connection with the annual meeting of the national chamber.

The discussions developed strong sentiment both for repeal of the criminal provisions of the present laws and for the creation of powers in some government agency which would give that agency authority to give advance advisory opinions on the legality of proposals for mergers and other cooperative or concerted action submitted to it by business groups. Creation of such an agency was stressed by Rush C. Butler, chairman of a committee of the American Bar Association which has been wrestling with the problem of the effects of existing laws upon business progress and stability.

As spokesman for the bituminous coal industry, C. E. Bockus, president, National Coal Association, frankly told the round-table conference that "practically nothing" had been accomplished toward stabilization of soft-coal production. Newcastle operators, faced with overproduction in 1965, he said, took the only practical cure for the ills then plaguing them by voluntarily agreeing to shutdowns to bring output in line with demand. Today, in this country, the law is thought to threaten such action, even if voluntary agreements otherwise could be effected and observed. No consumer would be damaged by such an agreement, because latent competition would keep prices down.

Many conditions, Mr. Bockus pointed out, operate to create and continue surplus capacity in the bituminous fields. Undeveloped coal lands are a liability instead of an asset, because of taxes, interest, and overhead management charges. Increasing overhead, augmented by the spread of mechanization, is a constant spur to larger output; certain natural conditions make intermittent operations more costly and more dangerous; desire to keep labor employed also is a factor.

"The coal industry," he concluded, "by the slow processes of elimination and consolidation is cutting down the immediate potential capacity of the mines. By means of bureaus, institutes, and similar associations, it is making some progress in stabilization in certain fields. It almost goes without saying that this movement would be assisted by a more liberal and constructive administration of the laws. That neither movement is as yet successful is self-evident; the yearly

reports of strong, well-managed companies is irrefutable proof of that fact."

That the present statutes might be construed ultimately to prohibit efforts to effect a reasonable balance between output and demand was a conclusion which Goldthwaite H. Dorr, one of the attorneys who represented the bituminous operators during the investigations of the United States Coal Commission several years ago, was inclined to challenge. Nevertheless, he admitted that "the anti-trust laws are practical obstacles to intelligent planning and concerted effort in dealing with the problems of overproduction in the natural-resource industries—not so much because such plans, if carried out and tested in the courts, would be found to be offensive to the Sherman act as because of the uncertainty as to results, the essential unsuitability of indictment or equity suit as a method of testing such matters out, and the natural hesitancy of business men to embark on such efforts in the uncertainty that exists."

Decisions of the Supreme Court in cases which give a clear-cut presentation of the issues, he continued, "may ultimately help the situation." Declaratory definitions by Congress might be useful. Submission of proposed agreements to some government administrative body familiar with the facts would be an experiment worth trying in the natural-resource industries, because it has "so far succeeded reasonably well in certain other branches of industry"—including the railroad and shipping trades.

But even clarification of the present laws is not enough. There would still remain the problem of effecting voluntary agreements. "Certainly, however, the possibilities of voluntary action should be exhausted before involuntary action should be compelled. While such concerted action among producers looking to a reasonable adjustment of production to demand can at best prove but a mitigation for the difficulties which these industries experience, that is no reason for inaction.

"There is every reason why the situation should be clarified and industry should be relieved from any impression that it is necessary to boot-leg sound economics. It would be a misfortune, however, if, while awaiting the slow process of further clarification, all concerted steps toward the reasonable readjustment of production to demand were to be abandoned."

The repeal of the anti-trust laws, said William S. Bennet, vice-president, Edward Hines Lumber Co., who addressed the chamber on April 30, would not permit the natural-resource industries to fix prices, curtail production, or restrict competition because those actions would still be forbidden by state statutes and the common law.

Advance advisory rulings on proposed plans also were of doubtful value, since they would not estop legal action if the Department of Justice felt that actions taken under such agreements were not consonant with the tentatively approved plans.

Mr. Bennet looked with favor upon the suggestion, made by E. L. Greever at the meeting of the mineral section of the American Bar Association at Chicago last August, that the criminal features of the act be repealed. These provisions, he contended, did not deter the deliberate and intentional violator but held back the honorable and well-intentioned groups from launching constructive programs which might fall within the twilight zone.

Neither coal nor lumber, declared Mr. Bennet, are in a position to ask for repeal, because neither industry is doing all that it now can legally to set its house in order. The fundamental weakness in both industries is bad distribution, but steps have been taken to correct this situation. That the bituminous coal industry is neither "hopeless" nor "helpless" is shown by the creation of the Committee of Ten, the small-stoker campaign, and the study being given to the possibilities of establishing regional sales organizations.

The natural-resources division adopted a resolution urging the Chamber "to appoint a committee to inquire into the feasibility of the establishment of an administrative agency to interpret the needs of industry to Congress or to proper governmental authorities."

Gross Income Base Favored

After a discussion of the various phases of depletion, particularly with respect to the difficulties of administration where captive mines are concerned, the tax and cost-accounting section of the Market Research Institute of the National Coal Association, at a meeting in Chicago, April 17, concluded that Congress should be urged to adopt a plan based on a percentage of the gross earnings rather than on net earnings. This plan was advocated by the National Coal Association during hearings on the 1926 Revenue Bill.

Coal Tax Opposed

Alabama coal operators will stage a strong fight before the Revenue Commission of the present State Legislature for the repeal of the severance tax of 2½c. per ton on coal taken from the ground. The levy was made in 1919 as an emergency measure, and the operators in the state declare that it has resulted in a large loss of tonnage in territories which otherwise would have used Alabama coal. It also is asserted that the levy, in conjunction with a tax of 4½c. per ton on ore and limestone, has increased the cost of pig iron, with resultant loss of markets for Alabama furnaces.

Anthracite Strikes Come to an End in April; Trouble Flares Up in Harlan County

THE general strike of anthracite miners in the Wyoming Valley, called on March 24, by the general grievance committee representing locals at collieries of the Glen Alden Coal Co., was ended on April 9, after spreading from the original area to collieries of the company in the Lackawanna Valley. A total of 25 operations were affected before the strike, conducted in defiance of the wishes of the officers of District 1, United Mine Workers, was terminated. The strikers were successful in obtaining their major objective when Major W. W. Inglis, president of the company, agreed on April 8 to meet directly with representatives of the men in the solution of alleged "intolerable conditions."

Miners employed in the Panther Creek Valley anthracite region by the Lehigh Navigation Coal Co. took action early in April to test their right to introduce a new working schedule. Following a vote in favor of a five-day working week, taken without the authority of the District 7 officials, the miners remained away from work on April 4, asserting that with slack working time the holiday was justified to give employment to a greater number. The coal company protested that the move violated the anthracite agreement, and took steps to lay the case before the Anthracite Conciliation Board. Meanwhile, the miners have continued in their refusal to work on Saturday.

Members of several locals at collieries of the Philadelphia & Reading Coal & Iron Co. also defied their district officials and went on strike April 15 against alleged inequalities in working time. The trouble centered at the Locust Gap colliery. Employees at the Locust Summit central breaker struck in sympathy, shutting down all the tributary collieries from Mt. Carmel to Ashland, Pa. About 11,000 men in District 9 of the United Mine Workers were affected by the stoppage.

On April 18, the strike spread to the Bear Valley colliery, and insurgents announced that they would form their own union unless grievances were remedied. Bear Valley miners, however, went back to work on April 21, and later were followed by striking employees at Oak Hill colliery. The stoppage ended on April 27, after Locust Gap miners voted on the previous day to return to work pending settlement of the differences.

Violence featured an outbreak of labor trouble in Harlan County, Kentucky, last month. On April 16, a crowd of armed men, estimated to number 100, beat an employee of the Black Mountain Coal Corporation at Evarts. Following this incident, a posse sent in to quiet the district was fired on on April 17, and Jess Pace, a deputy sheriff, was killed. United Mine Workers officials, including Lee Lively, W. B. Jones, and William Green, addressed a meeting of miners in Harlan on April 18, and

urged that the campaign for recognition of the union be carried on without "use of arms."

After a quiet Sunday, the plant of the Burger Coal Mining Co., at Shields, Ky., was bombed on April 20, though the damage was not serious. Later in the week, two chain stores at Evarts were robbed and the commissary of the East Harlan Coal Co., Draper, Ky., was looted of about \$1,500 worth of foodstuffs on April 26. Federal Judge A. M. J. Cochran, eastern Kentucky division, took a hand in the situation on April 25, granting a temporary injunction against Wm. Turnblazer, president, District 20, United Mine Workers; and Milt Harbin and Peggy McGuire, organizers, restraining them from coming on the premises of the P. V. & K. Coal Co., Lejunior, Ky., and the Black Mountain Coal Corporation, at Evarts, or from influencing or interfering with the employees of the companies.

About 200 delegates, said to represent 40,000 miners, attended a "rank and file" miners' convention at St. Louis, Mo., April 15-16. The meeting was called by Alexander Howat, of Kansas, president of the former insurgent faction of the United Mine Workers, to protest against the compromise effected between the officials of District 12 and Lewis. Delegates expressed doubt of their ability to carry out the suggestion of Powers Hapgood, of Indianapolis, Ind., that a "revolutionary union based on the ultimate goal of nationalization of basic industries" be formed, and for that reason agreed only upon the formation of a committee to continue the fight against Lewis by means of an educational campaign.

Kennedy Named as Field Man In N.C.A. Safety Drive

John C. Kennedy, Charleston, W. Va., formerly with the Elk River Coal & Lumber Co. and the West Virginia Department of Mines, has been made field man in charge of organization of safety institutes by the safety committee of the National Coal Association. Mr. Kennedy will meet with a subcommittee in Washington, D. C., April 28, at which time final plans for the work will be outlined in accordance with the program adopted at the Chicago meeting on March 17 (*Coal Age*, April, 1931, p. 186).

Another subcommittee was named last month by Milton H. Fies, vice-president, DeBardeleben Coal Corporation, Birmingham, Ala., and chairman of the safety committee, to delve into the matter of the choice and tenure of office of mine inspectors in cooperation with the U. S. Bureau of Mines and mine chiefs' organizations. Members of the subcommittee are: C. W. Connor, superintendent of mines, Amer-



John C. Kennedy

ican Rolling Mill Co., Nellis, W. Va. (chairman); P. L. Donie, Linton, Ind., vice-president, Little Betty Mining Corporation; and Otto Herres, Salt Lake City, Utah, assistant manager, United States Fuel Co.

Illinois Rules on Explosives

Modifying an opinion promulgated on March 31 to the effect that Cardox is an explosive within the provisions of Section 4 of the Illinois Shotfiring Act, and consequently must not be used except when all the men except those necessary at the time of the firing are out of the mines, Oscar E. Carlstrom, Attorney General, after protest by the operators, ruled on April 20 that blasting may be done "during the lunch hour and at quitting time" under appropriate protective regulations.

No firing is permitted unless all men are withdrawn from the working places to a point of safety designated by the state mine inspector; blasting is done by men selected by the mine manager; electric power is cut off all wires leading to the working places; all men in or out of the working places are accounted for by means of a prearranged signal; all places are examined for gas before blasting at the noon hour; men are not permitted to return until the shooter comes out of the working place; and a permissible type of battery is used for blasting.

Koppers Takes Over Mine

Operation of the Beards Fork mine of the Loup Creek Colliery Co., located at Beards Fork, W. Va., will be taken over by the Koppers Coal Co. on May 1. The Loup Creek company is a Virginian Ry. interest, and the Beards Fork mine operates in the No. 2 Gas seam.

Speakers Named for Sessions Of Midwest Conference

Value and utilization of Mid-Western coal will be discussed by more than twenty speakers at the 1931 Midwest Bituminous Coal Conference, to be held at the University of Illinois, Urbana, May 21-22. Papers and speakers scheduled for the session on value of Mid-Western coal are: "Methods of Determining the Relative Value of Coals," W. D. Langtry, Chicago, president, Commercial Testing & Engineering Co.; "To What Extent Have Mid-west Coals Met Competitive Demands for Better Preparation?" John A. Garcia and H. C. Cooley, Allen & Garcia Co., Chicago; "Comparative Heating Value of Fuels in the Research Residence," A. C. Willard, professor, heating and ventilation, and head, department of mechanical engineering, University of Illinois. A paper on the economics and the utilization of natural gas will be presented by a speaker yet to be chosen.

"What Does the Future Hold for Mid-west Coal?" will be the subject of S. W. Parr, emeritus, professor of applied chemistry, University of Illinois, at the dinner session on the first day. At the evening sessions the following papers will be presented: "The Coal Research Program of the State Geological Survey," M. M. Leighton, chief, Illinois State Geological Survey, Urbana; "Space Requirements for Coal-Burning Plants" (speaker to be chosen); and "The Committee of Ten, Its Activities and Purposes," Oliver J. Grimes, managing director, Chicago.

The opening session on May 22 will be devoted to "domestic utilization." "Recommended Setting Heights for Heating Boilers Equipped With Mechanical Stokers," by E. L. Beckwith, chairman, engineering committee, Midwest Stoker Association, Chicago, will be the first paper. Discussion of the paper, and of fuel-burning rates, furnace temperatures, and other topics, will be led by a committee consisting of T. A. Marsh, St. Louis, Mo., president, Modern Coal Burner Co.; J. H. Walter, national sales representative, Iron Fireman Mfg. Co., Portland, Ore.; and Joseph Harrington, president, Harrington Stoker Co., Chicago. "A Study of Small Stokers for Semi-Industrial and Plant Uses" will be presented by G. A. Young, professor and head of the School of Mechanical Engineering, Purdue University, Lafayette, Ind., and W. T. Miller, instructor. "Operating Tests of Stokers in Service" and "Burning Area Requirements as Established by Actual Boiler Tests" will be outlined by speakers yet to be named.

The final session will be devoted to "industrial utilization." Lisle A. Pierson, Detroit, Mich., vice-president, National Association of Power Engineers, will speak on "Adapting the Power Plant to Local Coals." "Mid-west Coal Combustion Tests" will be outlined by A. P. Kratz, Urbana, research professor, department of mechanical engineering, for the University of Illinois, and by A. A. Potter, Lafayette,

Explosives Approved

Four additions to the active list of permissible explosives were made by the U. S. Bureau of Mines in February and March, as follows:

(1) Illinois Powder Mfg. Co., Black Diamond No. 9; volume of poisonous gases, between 53 and 106 liters, inclusive; characteristic ingredient, ammonium nitrate with explosive sensitizer; weight of 1½x8-in. cartridge, 144 grams; smallest permissible diameter, ¾ in.; unit defective charge, 222 grams; rate of detonation, 8,530 ft. per second.

(2) E. I. duPont de Nemours & Co., Inc., Duobel No. 4, L. F.; volume of poisonous gases, between 53 and 106 liters, inclusive; characteristic ingredient, ammonium nitrate with explosive sensitizer; weight of 1½x8-in. cartridge, 111 grams; smallest permissible diameter, ¾ in.; unit defective charge, 209 grams; rate of detonation, 7,940 ft. per second.

In addition to approving the explosives described above, the Bureau of Mines in February granted Approval 5 to Cardox Model D, made by the Safety Mining Co. Length of shell of the blasting device is 46½ in., and the diameter is 2½ in.

(3) Burton Explosives, Inc., Burton 5, L. F.; volume of poisonous gases, less than 53 liters; characteristic ingredient, ammonium nitrate with explosive sensitizer; weight of 1½x8-in. cartridge, 143 grams; smallest permissible diameter, ¾ in.; unit defective charge, 205 grams; rate of detonation, 7,220 ft. per second.

(4) Burton Explosives, Inc., Burton 7, L. F.; volume of poisonous gases, less than 53 liters; characteristic ingredient, ammonium nitrate with explosive sensitizer; weight of 1½x8-in. cartridge, 134 grams; smallest permissible diameter, ¾ in.; unit defective charge, 207 grams; rate of detonation, 7,410 ft. per second.

dean of engineering and director of the engineering experiment station, for Purdue University. "Training of Plant Operators to Use Illinois and Indiana Coals" will be the subject of A. A. Cole, professor of steam engineering, Purdue University. A paper on pulverized coal has been scheduled, but the speaker has not yet been named.

Natural Gas Sales Drop

Sales of natural gas by companies representing 90 per cent of the public utility distribution dropped to 67,649,189,000 cu.ft. in February, a decrease of 16 per cent from the total in the same month in 1930. The major part of the decline was due to the drop in sales for industrial purposes, which slumped from 19,965,458,000 cu.ft. in February, 1930, to 16,879,651,000 cu.ft. in February, 1931. The decrease in industrial consumption was most pronounced in the highly industrialized states of the East and the Middle West, the average decline for the states of New York, Pennsylvania, West Virginia, and Ohio being approximately 27 per cent.

While admitting that it is "both feasible and practicable" to produce a solid smokeless fuel from the state's bituminous coal deposits, the Utah Public Utilities Commission last month granted the Wasatch Gas Co. the right to serve eight cities in the state over the protest of Lewis C. Karrick, who

appeared for the public. Mr. Karrick told the commission that processing of Utah coal was perfectly feasible, and in this the commission agreed, though since "there is not now a plant nor is there any assurance given that in the immediate future there will be a plant constructed in Utah for the processing of Utah coal," the application of the gas company was granted as in the public interest.

Activity in the new Tioga County (Pennsylvania) gas district reached a new high level in April. Over 25 locations were made in readiness for an intensive drilling campaign. Operations in the field got under way a few weeks ago with the completion of the Penn-United Gas Co. well, producing 100,000,000 cu.ft. daily. In addition, the J. C. Trees and Benedum-Trees wells were brought in with, respectively, productions of 15,000,000 and 25,000,000 cu.ft. daily. Companies planning to drill include a number of independents, as well as the Allegheny Gas Co., Penn-United Gas Co., Penn-Ohio Gas Co., and Benedum-Trees. In New York State in April, a well producing 9,000,000 cu.ft. daily was brought in in the Altay field fifteen miles northwest of Watkins Glen. This well is the second producer in the field.

New Credit Organization Formed By N.C.A. Group

Articles of incorporation for a new credit organization, to be known as the National Coal Credit Corporation (non-profit), were signed in Cincinnati, Ohio, April 24, and will be filed in Columbus. Action at the April 24 meeting was taken in accordance with a resolution passed at a meeting of representatives of the National Coal Association in Cincinnati, April 15, to the effect:

That the commercial research section of the Market Research Institute of the National Coal Association places itself on record in favor of the broadest possible credit information service for the bituminous coal industry; further, that the Section recommends the formation of a central bureau for credit interchange and delinquent accounts report service within the industry; and further, that the chairman of the section be authorized to name a special committee, himself to act as its chairman, for the purpose of working out plans for an organization of that character to be incorporated and to be separate from the National Coal Association, and with consideration of a collection department, these plans to be submitted to a representative body of interested parties for action at the earliest possible date.

Incorporators were: C. C. Dickinson, president, Dickinson Fuel Co.; D. D. Hull, vice-president, Virginia Iron, Coal & Coke Co.; and K. U. Meguire, president, Dawson Daylight Coal Co. Principal offices of the organization will be located at Cincinnati. According to present indications, the corporation will represent at the outset about 175,000,000 tons.

At the April 15 meeting, the commercial research section gave special attention to the advisability of the following analysis of sales distribution costs: over-all selling costs per ton, all

business; over-all selling costs per ton in salaries or commissions to salesmen, advertising (publications by classes, direct-mail, billboards, miscellaneous), traveling, office, and general overhead.

The section also recommended to the Committee of Ten—Coal and Heating Industries the following program: analysis of small stoker sales on the basis of monthly or quarterly reports (retroactive to 1928), showing sales by states and also by sizes, whether for individual homes, apartment houses, hotels, or office buildings, or for industrial power or heating; continuous study of the smoke-abatement movement in the United States; research in better home-heating to evaluate the possibilities of enlarging the domestic heating market; and a continuous study of competitive fuels to show the classes of consumers using such fuels, types of equipment in which such fuels are burned, prices of competitive fuels, where and how bituminous coal has met the competition, amount of business lost to competitive fuels, and the reasons for the losses. Decision to proceed with the survey was made by the Committee of Ten at a meeting in Columbus, Ohio, April 22.

Mechanization Lowers Accidents, Ohio Meeting Told

Mechanization of coal mines in Ohio does not tend to increase injuries, but instead results in radical reduction in the number and severity of compensable accidents, declared R. L. Ireland, Jr., Cleveland, Ohio, vice-president, Hanna Coal Co., at the coal and clay sessions of the fourth annual All-Ohio Safety Congress, held in Columbus, April 21-23. William Roy, Cleveland, safety engineer of the Hanna Coal Co., presided at the meeting, which was attended by 100 operators, foremen, and safety engineers.

With hand loading, the Hanna mines in January, 1930, produced the following tonnages per compensable accident: No. 1, 14,319.30 tons; No. 6, 8,760.34 tons; No. 9, 8,057.21 tons; Piney Fork mines, 8,408 tons. In January, 1931, the same mines showed the following tonnages per accident: No. 1, 35,889.60 tons; No. 6, 46,120.35 tons; No. 9, 25,037.52 tons; Piney Fork No. 1, 9,778 tons; Piney Fork No. 2, 9,847 tons. The Wheeling & Lake Erie Coal Mining Co. mines, ranging from partial to full mechanization, produced 107,047.57 tons with only three compensable accidents in January, 1931. The Jefferson mines, with hand loading, produced 58,902 tons in January, 1931, and had six compensable accidents.

Statistics on the operation of the Hanna mines in the first quarter of 1930 reveal the following accident totals: No. 1, 33; No. 6, 34; No. 9, 20. In January, February, and March, 1931, the number was reduced to the following: No. 1, 9; No. 6, 12; No. 9, 5. During this period of 1931, the three mines produced 280,933.89 tons, or 21,610.30 tons per compensable accident, as against an average of 8,408.19 tons per compen-

Anthracite Prices at New York, Effective May 1, 1931*

	Broken (Grate)	Egg (Furnace)	Per Stove	Net Ton, Chest- nut	F.O.B. Pea	Mines Buck- wheat	Rice	Barley
Delaware, Lackawanna & Western Coal Co.	\$6.70	\$6.95	\$7.20	\$7.20	\$4.95	\$3.25 ¹	\$1.85 ²	\$1.40
Philadelphia & Reading Coal & Iron Co.	6.70	6.95	7.20	7.20	4.95	3.25 ¹	1.85 ⁴	1.40
Lehigh Valley Coal Sales Co.	6.70	6.95	7.20	7.20	4.95	3.25	1.85	1.40
Lehigh Navigation Coal Co.	6.70	6.95	7.20	7.20	4.95	3.25	1.85	1.40
Hudson Coal Co. ³	6.70	6.95	7.20	7.20	4.95	3.25 ¹	1.85	1.40
M. A. Hanna Co.	6.70	6.95	7.20	7.20	4.95	3.25	1.85	1.40
Dickson & Eddy	6.70	6.95	7.20	7.20	4.95	3.25	1.85	1.40
Madeira, Hill & Co.	6.70	6.95	7.20	7.20	4.95	3.25	1.85	1.40
Payne Coal Co.	6.70	6.95	7.20	7.20	4.95	3.25	1.85	1.40
General Coal Co.:								
Raven Run, Maryland		6.95	7.20	7.20	4.95	3.25	1.85	1.40
Hazle Brook		7.20	7.45	7.45	5.20	3.50	2.05	1.60
Midvalley		7.10	7.35	7.35	5.10	3.40	2.00	1.60
Cross Creek		7.05	7.30	7.30	5.05	3.25	1.85	1.40
Fuel Service Co.:								
Beaver Meadow, Kingston, Westwood		6.95	7.20	7.20	4.95	3.25	1.85	1.40
Jeddo		7.45	7.70	7.70	5.85	3.50	2.00	1.50
Highland		7.30	7.55	7.55	5.85	3.55	2.10	1.50
Cross Creek		7.05	7.30	7.30	5.05	3.25	1.85	1.40

* Domestic buckwheat, \$3.70. ² Stoker rice, \$2.30. ³ Stoker buckwheat, \$3.75. ⁴ Stoker rice, \$2.35. ⁵ Birdseye, \$1.50. *Terms, 30 days net. Discounts are allowed as follows for payment within 15 days of shipment: Broken, egg, stove, and chestnut, 20c.; pea, 15c.; buckwheat, 10c.; rice, barley, and birdseye, 5c.

sable accident for the entire year of 1930. At No. 9, the most modern mine, 10,151 man-days was worked in the first quarter of 1931, and 67,411.79 tons was produced without a compensable accident inside the mine.

Mr. Roy was re-elected chairman of the section, and John Jenkins, Martin's Ferry, Ohio, safety commissioner, Youghiogheny & Ohio Coal Co., was again chosen secretary. A large majority of those present indicated their desire to hold an Ohio safety meet, and this matter will be taken up by the Ohio Division of Mines and Mining.

Non-Fatal Coal-Mine Accidents To Be Studied

A nation-wide canvass of coal mines to determine the number and causes of non-fatal accidents in 1930 is being conducted by the U. S. Bureau of Mines. To date, reports have been received from half of the operating companies, according to Scott Turner, director of the Bureau. Figures already compiled show that 270,000 bituminous miners and 62,000 anthracite miners were employed in 1930 to produce 275,000,000 tons of soft coal and 27,000,000 tons of anthracite. The men averaged 195 workdays in bituminous mines and 204 workdays in anthracite mines. Average daily output of coal per employee was 5.2 tons in bituminous mines and 2.1 tons in anthracite mines. With this production, the returns for bituminous mines show 2.6 deaths and 142 non-fatal injuries for each million tons of coal produced; in anthracite mines there were 7.8 deaths and 530 non-fatal injuries for each million tons of output.

Assuming an 8-hour day at all mines, the records show 95 accidents of all kinds, both fatal and non-fatal, for each million man-hours of work performed at bituminous mines and 144 accidents for each million man-hours at anthracite mines, according to the Bureau. These figures are based on reports covering all "lost-time" accidents, which means all accidents that disabled an employee for more than the remainder of the day on which the accident occurred.

For each death in bituminous mines the returns thus far received reveal 54 non-fatal injuries; corresponding records for anthracite mines show 68 injuries for every fatality. Bituminous mines produced 378,000 tons of coal for each fatality and 7,000 tons for each non-fatal injury. The production in anthracite mines averaged 128,000 tons for each fatality and 1,900 tons for each injury.

Trade Mark Registration Refused Montevallo

In its refusal to register the word "Montevallo" as a trade name for coal mined by the Montevallo Coal Mining Co., Birmingham, Ala., the U. S. Patent Office was upheld by the Court of Customs and Patent Appeals in a decision handed down last month. The trademark was registered in 1923, but pursuant to action brought by the Little Gem Coal Co. (Alabama), it was canceled. Re-registration was sought under the clause of the law which permits the registration of a trademark which had been used exclusively by a company for a period of ten years prior to Feb. 20, 1905, and was denied by the examiner and the assistant commissioner of patents in separate proceedings.

Safety Association Formed

Fifty-five operators and mine officials, representing 90 per cent of the production of the field, formed the Tenth Bituminous District Council of the Holmes Safety Association at a meeting in Cresson, Pa., last month. Officers elected at the meeting were: Alexander Jack, Cresson, inspector, Tenth bituminous district, Pennsylvania Department of Mines; first vice-president, A. L. Hunt, Cresson, general superintendent, Pennsylvania Coal & Coke Corporation; second vice-president, L. F. Crouse, Revloc, Pa., general superintendent, Monroe Coal Mining Co.; and secretary-treasurer, James Gatehouse, Cresson, chief inspector, Pennsylvania Coal & Coke Corporation.

Indorse Cooperative Plan

Indorsement of a plan for the formation of boards of coal-operating men to cooperate with universities in the different fields of the country was the major result of a joint meeting of the technical research section of the Market Research Institute of the National Coal Association with eight members of the faculty of the engineering department of Purdue University, held at Lafayette, Ind., April 20. The technical research section went on record in favor of:

The formation of advisory boards of operators to cooperate and promote coal research of every character with the universities located in their respective communities or states. A plan on the order of that by which the advisory board of Carnegie Institute of Technology functions will be submitted by the section to all district operators' associations with the recommendation that it would be advisable to organize somewhat similar committees or boards in their respective districts.

The employment by the National Coal Association, when finances permit, of a technically trained man for the translation into laymen's language of current research data of practical value for distribution throughout the industry and for the advancement and the correlation of the programs of the proposed advisory boards.

Development of information regarding the advisability of promoting short courses in combustion engineering under the auspices of universities and in the interests of members of the coal industry.

Columbus Forms Heating Group

Coal producers, wholesalers, retailers, and representatives of equipment manufacturers held a meeting in Columbus, Ohio, April 23, to discuss the organization of a local branch to cooperate with the Committee of Ten—Coal and Heating Industries. The work of the committee was outlined by Carlyle Terry, Delaware, Lackawanna & Western Coal Co., who represented the Anthracite Institute, New York City, and R. A. Miller, Chicago, representing the National Retail Coal Merchants' Association.

After discussion of the problem, a temporary organization was formed, with George K. Smith, Columbus, president, Sunday Creek Coal Co., as chairman, and a further meeting, to which railroad men, architects, building contractors, representatives of the heating equipment interests, and others interested in coal will be invited, was scheduled for May.

To Study Mine Timber

A study of mine timber to determine the most economical size, the most serviceable species, and the most suitable grade, either treated or untreated, to meet the various requirements of the mining industry, will be carried on by the Mine Timber Committee of the National Standardization Division of the American Mining Congress, under the chairmanship of Reamy Joyce, Chicago, vice-president, Joyce-Watkins Co., who is organizing geographical subcommittees to study and recommend methods for application to all the mining fields of the country. A service records committee also will be formed

Permissible Plates Issued

Seven approvals of permissible equipment were issued by the U. S. Bureau of Mines during the first quarter of 1931, as follows:

- (1) Fairmont Mining Machinery Co.; 100-g.p.m. mine pump; 7½-hp. motor, 230-500 volts, d.c.; Approvals 214 and 214A; Jan. 2.
- (2) Fairmont Mining Machinery Co.; 50-g.p.m. mine pump; 3-hp. motor, 230-500 volts, d.c.; Approvals 215 and 215A; Jan. 2.
- (3) Goodman Mfg. Co.; Type 524-E.J. slabbing machine; 50-hp. motor, 210-500 volts, d.c.; Approvals 216 and 216A; Feb. 12.
- (4) Jeffrey Mfg. Co.; Type 44-C loading machine; two 7½-hp. motors, 220-440 volts, a.c.; Approvals 217 and 217A; Feb. 27.
- (5) Goodman Mfg. Co.; Type L-8CL3 longwall mining machine; 50-hp. motor, 220-440 volts, a.c.; Approvals 218 and 218A; March 10.
- (6) Gellatly & Co.; conveyor; 2-hp. motor, 500 volts, d.c.; Approval 219A; March 11.
- (7) Mine Safety Appliances Co.; Models E and G portable floodlights; Approvals 1006E and 1006G; Feb. 11.

Rowe and Thomas Advanced

E. J. Rowe has been elected president and Howard J. Thomas has been chosen vice-president of the Yolande Coal & Coke Co. and the Davis Creek Coal & Coke Co., Birmingham, Ala. Mr. Rowe, who succeeds J. B. McClary, deceased, also is president of the Porter Coal Co. and a member of the sales agency of Adams, Rowe & Norman, Inc. Mr. Thomas, who for many years was superintendent of mines for the Sloss-Sheffield Steel & Iron Co., became general superintendent of the Yolande and Davis Creek companies early in 1931.

Obituary

HERMAN PERRY, general superintendent of the Indiana & Illinois Coal Corporation, Chicago, died at his home at Hillsboro, Ill., April 13, after an attack of intestinal influenza. Mr. Perry, who was 65, entered the coal business at an early age as a tracklayer, and subsequently was president of District 12 of the United Mine Workers and vice-president of the Illinois Coal Operators' Association.

JOHN HUNTER, 65, general manager of the Dingess Run Coal Co., died at his home at McConnell, W. Va., April 16, after an illness of five months.

PRESTON H. HASKELL, 60, president of the Columbia Mining Co., Columbia, Tenn., died at his home in that city April 13. Mr. Haskell was graduated from the University of South Carolina as a mining engineer, and later studied in Germany. For several years he was connected with the engineering department of the Tennessee Coal, Iron & R.R. Co., and later engaged in projects in Virginia and Honduras, prior to his becoming president of the Columbia company.

Anthracite Tax to End

The tax on anthracite production imposed by the State of Pennsylvania, which originally amounted to 1.5 per cent of the mine price, will end May 31. The original levy was reduced to 1 per cent on May 31, 1929, and to 0.5 per cent on May 31, 1930. Elimination of the tax in three equal instalments was provided in a bill passed in 1929.

Coal Consumption in U. S.

The railroads of the country lead all other interests in the consumption of bituminous coal in a typical year, according to figures compiled by F. G. Tryon and H. O. Rogers, U. S. Bureau of Mines, and reproduced in part in the accompanying table. As a class, domestic consumers stand second, and are followed in order by general manufacturing, coke ovens, and electric utilities.

In general, the data in the table cover the year 1929, with the following exceptions: steel, general manufacturing, coal- and water-gas plants, 1927; mines and quarries other than coal, 1919. In regard to the manufacturing industry, the authors remark that it was necessary to use 1927, "a year of only moderate activity. If the record for 1929 were available, many of the manufacturing groups might show a somewhat higher rate of consumption."

Consumption of Bituminous Coal by Uses In a Typical Year of Industrial Activity

	Net Tons Consumed	Per Cent of Total
Railroad fuel (all steam roads):		
Locomotive fuel.....	118,600,000	23.7
All other (shops, stations, etc.)	12,500,000	2.5
Coke ovens:		
Byproduct.....	76,759,000	15.4
Beehive.....	10,028,000	2.0
Electric utilities.....	42,785,000	8.6
Steel works:		
Gas coal.....	8,300,000	1.6
Steam coal.....	14,309,000	2.9
General manufacturing:		
Stone, clay, and glass products	24,155,000	4.8
Metals and metal products other than steel	14,814,000	3.0
Food products (not including ice)	11,239,000	2.2
Chemicals and fertilizers.....	9,803,000	2.0
Paper, pulp, and printing.....	9,515,000	1.9
Textiles and their products.....	7,865,000	1.6
Petroleum refining.....	3,632,000	0.7
Leather and rubber products	3,777,000	0.8
Lumber and wood products.....	3,140,000	0.6
Miscellaneous manufacturing industries.....	2,506,000	0.5
Ice.....	1,604,000	0.3
Coal-gas and water-gas plants ²	6,252,000	1.3
Coal-mine fuel.....	4,662,000	0.9
Mines and quarries other than coal.....	4,190,000	0.8
Bunker:		
Foreign.....	4,287,000	0.8
Domestic (incomplete).....	3,407,000	0.7
Domestic and all other uses ³	102,000,000	20.4
Grand total.....	500,129,000	100.0

¹ Includes motor vehicles. ² Bituminous coal used for gas making and boiler fuel, not including that charged in by product ovens operated by city gas companies. ³ Includes heating large buildings other than factories, such as hotels, apartments, stores, offices, theaters, garages, and service stations; also a number of other items that cannot be separated, such as waterworks construction industry, threshing, public institutions, central heating plants, laundries, and very small industrial consumers not covered by the Census of Manufactures. Because of inclusion of these items, total for this group is not comparable with estimates of consumption for "domestic use" hitherto published.

Coal-Mine Fatality Rate Rises in March, 1931, But Is Lower Than a Year Ago

THE fatality rate from accidents at coal mines in the United States in March, 1931, while not as favorable as the unusually low rate that prevailed in the preceding month, represented a marked improvement as compared with March a year ago. The rate for bituminous mines alone likewise was much better than that of March of last year, although it was not as low as the rate for February of the present year. On the other hand, the fatality rate for anthracite mines (Pennsylvania) was much more favorable in March, 1931, than in either the preceding month of February or in March, 1930. These facts are revealed by reports furnished by state mine inspectors to the U. S. Bureau of Mines.

Reports for March, 1931, showed that 116 men were killed in the coal mines of the United States during that month, an increase of 10 over the number reported for the previous month but a decrease of 55 from March, 1930. The production of coal in March was 38,615,000 tons, an increase of 1,816,000 tons over February of the present year, and a decrease of 1,629,000 tons from March, 1930. The death rate per million tons of coal produced in March, 1931, was 3, an increase of 3 per cent over the rate for the previous month, and a decrease of slightly more than 29 per cent from the rate for March, 1930.

The March rate for bituminous mines alone was 2.78, based upon 94 fatalities and an output of 33,870,000 tons, while that for March of last year was 3.94, based upon 141 fatalities and a production of 35,773,000 tons. Revised reports for February, 1931, showed 65 fatalities, a production of 31,408,000 tons, and a fatality rate of 2.07.

In the anthracite mines of Pennsylvania 22 men lost their lives during the month. With a production of 4,745,000 tons this gives a death rate of 4.64 per million tons mined; this rate is next to the lowest rate ever reported for March and one of the lowest rates on record for any month. In March of last year the anthracite record showed 30 deaths, a production of 4,471,000 tons, and a fatality rate of 6.71. Revised records for February of the present year reveal 41 deaths, 5,391,000 tons of coal mined, and a fatality rate of 7.61.

Reports for the first three months of 1931 show that accidents in all coal mines in the United States have caused the loss of 403 lives. The production of coal during this period was 120,113,000 tons, resulting in a death rate of 3.36, as compared with 3.97 for the same period in 1930, based on 566 deaths and 142,539,000 tons. During the three-month period, bituminous mines produced 103,820,000 tons of coal and had 299 fatal accidents, thus

showing a fatality rate of 2.88, as compared with a rate of 3.56 for the same period last year, when an output of 125,106,000 tons with 445 deaths was reported. Anthracite mines produced 16,293,000 tons of coal with 104 fatalities during the first quarter of 1931, the death rate being 6.38, as compared with last year's record for the same three months showing a rate of 6.94, based on 121 deaths and 17,433,000 tons.

There were no major disasters—that is disasters in each of which five or more lives were lost—at any coal mine during March or February, of the present year, but three such disasters in January, causing 41 deaths, resulted in a death rate of 0.341 per million tons of coal mined during the three-month period. For the same period in 1930 there were 71 deaths caused by six major disasters, with a combined fatality rate of 0.498. The major disasters thus far in 1931 occurred at the rate of 2.50 separate disasters (as distinguished from the number of deaths resulting from the disasters) for each hundred million tons of coal produced, as compared with 4.21 separate disasters per hundred million tons for the corresponding three-month period last year.

Comparative fatality rates for the first quarter of 1931 and 1930 are as follows:

Cause	1930	Jan.-March, 1930	Jan.-March, 1931
All causes	3.798	3.971	3.355
Falls of roof and coal	2.012	2.049	1.807
Haulage	.572	.617	.550
Gas or dust explosions:			
Local explosions	.115	.176	.033
Major explosions	.404	.477	.341
Explosives	.147	.154	.083
Electricity	.143	.140	.083
Miscellaneous	.405	.358	.058

Coal-Mine Fatalities During March, 1931, by Causes and States

(Compiled by Bureau of Mines and published by *Coal Age*)

State	Underground											Shaft				Surface						Total by States				
	Falls of roof (coal, rock, etc.)	Falls of face or pillar coal	Mine cars and locomotives	Explosions of gas or coal dust	Explosives	Suffocation from mine gases	Electricity	Animals	Mining Machines	Mine fires (burned, suffocated, etc.)	Other causes	Total	Falling down shafts or slopes	Objects falling down shafts or slopes	Cage, skip, or bucket	Other causes	Total	Mine cars and mine locomotives	Electricity	Machinery	Boiler explosions or bursting steam pipes	Railway cars and locomotives	Other causes	Total	1931	1930
Alabama	1		2									3													3	6
Alaska																									0	0
Arkansas																									0	0
Colorado	2		1									3													3	4
Illinois	2				1		1					4												1	5	12
Indiana	1											1	1												2	2
Iowa																									0	2
Kansas	1											1													1	0
Kentucky	8		2				1					11													11	27
Maryland																									0	1
Michigan																									0	0
Missouri																									0	0
Montana	1											1													1	0
New Mexico																									0	1
North Dakota																									0	1
Ohio	8		1						1			10													10	9
Oklahoma																									0	0
Pennsylvania (bituminous)	6	1	3			1						11						1	1			1		3	14	18
South Dakota																									0	0
Tennessee																									0	2
Texas																									0	0
Utah	1		1									2													2	8
Virginia	2											2													2	5
Washington			1									1													1	1
West Virginia	17	7	9		1	1						35											1		36	42
Wyoming	2		1									3													3	0
Total (bituminous)	52	8	21		2	2	2		1			88	1					1	1	1	1	2		5	94	141
Pennsylvania (anthracite)	8	1	2		1	2	1					5						1		1		2		2	22	30
Total, March, 1931	60	9	23		3	4	3		1			108	1					1	2	1	1	1	2	7	116	
Total, March, 1930	68	8	31		39	6	2	4	1			166						1	2				1	4		171

Industrial Notes

B. M. HAUGHTON Co., Philadelphia, Pa., manufacturer of industrial oils, has opened a district office in the Comer Bldg., Birmingham, Ala., in charge of J. A. Brittain.

RELIANCE ELECTRIC & ENGINEERING Co., Cleveland, Ohio, has advanced M. C. Suerkin to the position of sales representative, with headquarters at the New York City office, and has made Robert M. Fitzgerald sales representative at the Philadelphia (Pa.) office.

ALFRED F. HOWE, after five years of retirement, has returned to the Borden Co., Warren, Ohio, as Western sales manager, with headquarters at Oakland, Ohio. Mr. Howe's territory includes Nevada and Arizona, as well as the Pacific Coast.

T. W. FRECH, granted a leave of absence on Jan. 1, 1930, to organize the RCA Radiotron Co., has been re-elected to his former position as vice-president of the General Electric Co., Schenectady, N. Y., in charge of incandescent lamps.

EDWIN T. HALL, for fifteen years a representative of the Sullivan Machinery Co. in the New England territory, has been made manager of the Boston (Mass.) office, vice the late George H. Richey.

BUCYRUS-ERIE Co., South Milwaukee, Wis., has taken over the manufacture and sale of the "Loadmaster" revolving boom crane, formerly sold by Frederic H. Poor, Inc., New York City.

THEODORE MARVIN, who has been assistant advertising manager of the Hercules Powder Co., Wilmington, Del., and editor of *The Explosives Engineer*, has been made advertising manager of the company, succeeding the late N. S. Greensfelder.

AT THE ANNUAL MEETING of Cutler-Hammer, Inc., Milwaukee, Wis., Frank R. Bacon, former chairman of the board, was elected president to fill the vacancy caused by the death of Beverly L. Worden. The office of chairman of the board was abolished. Other officers elected were: vice-presidents, F. L. Pierce and J. C. Wilson; treasurer, H. F. Vogt; secretary, W. C. Stevens. The board of directors, in addition to the officers, consists of the following: T. Johnson Ward, Cassatt & Co., Philadelphia, Pa.; Carl A. Johnson, president, Gisholt Machine Co., Madison, Wis.; L. A. Lecher, Bottum, Hudner, Lecher, McNamara & Michael, Milwaukee; G. S. Crane, general sales manager, Cutler-Hammer; E. A. Bacon, vice-president, First Wisconsin National Bank, Milwaukee. The new officers and board assume office at once.

Coming Meetings

American Mining Congress; annual convention, May 11-15, Cincinnati, Ohio.

Midwest Bituminous Coal Conference; May 21 and 22, at University of Illinois, Urbana, Ill.

Rocky Mountain Coal Mining Institute; annual meeting, June 3-5, Cosmopolitan Hotel, Denver, Colo.

National Retail Coal Merchants' Association; annual meeting, June 4-6, Hotel Lord Baltimore, Baltimore, Md.

Illinois Mining Institute; midsummer meeting, aboard steamer "Cape Girardeau," leaving St. Louis, Mo., Friday, June 5, and returning June 7.

National Association of Purchasing Agents; annual convention and "informa-show," June 8-11, Royal York Hotel, Toronto, Canada.

Colorado and New Mexico Coal Operators' Association; June 17, 513 Boston Bldg., Denver, Colo.

American Society for Testing Materials; annual meeting at the Stevens, Chicago, June 22-26.

Reading Ask Track Restoration To Reclaim Anthracite

Because of a shortage in smaller sizes of anthracite, the Reading R.R. has applied to the Interstate Commerce Commission for permission to restore its Helfenstein branch between Bickel Colliery, near Locustdale, Pa., and Doutyville, Pa., a distance of 4.75 miles, to reclaim 500,000 tons of buckwheat and smaller sizes from the Doutyville culm bank.

First-Aid Meets Scheduled

The Consolidation Coal Co. will hold its 1931 first-aid contests as follows: Pennsylvania division, Gray, Pa., May 21; Maryland division, Frostburg, Md., May 22; West Virginia division, Monongah, W. Va., May 23.

Mather collieries of Pickands, Mather & Co. will hold a first-aid and mine-rescue contest at Mather, Pa., June 19.

The twelfth annual first-aid contest of the New River Co., in which teams from all the mines of the company will participate, will be held at Scarbro, W. Va., June 13.

Anniversary Celebrated

Marking the first anniversary of the operation of the Wheelwright (Ky.) mines by the Inland Steel Co., William G. Fletcher, superintendent, gave a dinner to operating heads at the Wheelwright clubhouse recently. E. R. Price acted as toastmaster and short talks were given by those in attendance. In addition to Messrs. Fletcher and Price, guests were: J. T. Parker, H. C. Zimmerman, Dr. J. W. Bailey, G. C. Billips, Blaine Smith, Fred Blackburn, J. C. Osborne, and H. M. Wilkinson.

King Coal's Calendar for April

April 1—Partial strike of French miners restricts production in the Pas-de-Calais and Douai coal fields.

April 3—Indiana shaft operators and miners adopt a new wage agreement, continuing the old wage scale with a few changes in working conditions. The agreement runs from April 1, 1931, to April 1, 1932.

April 3—French miners abandon plan to strike in protest against a proposed wage reduction of 6 per cent. However, the walkout in the Pas-de-Calais field continued, as did local stoppages in other regions.

April 4—Miners employed by the Lehigh Navigation Coal Co. in the Panther Creek Valley anthracite field remain away from work after voting for a five-day week in defiance of the wishes of officials of District 7 of the United Mine Workers. The walkout is expected to test the right of the miners to introduce a working schedule without the consent of the coal company.

April 8—Miners in the Graissessac coal field of France go on strike against wage reduction. Strikers in the Pas-de-

Calais region return to work after a walkout lasting from March 30.

April 8—Strike of 20,000 anthracite miners employed by the Glen Alden Coal Co. in the Lackawanna and Wyoming valleys called off by the general grievance committee upon agreement of Major W. W. Inglis, president of the company, to treat directly with the men and officials of District 1 of the United Mine Workers in the settlement of grievances.

April 10—Scale convention of District 11 (Indiana), United Mine Workers, ratifies a new wage agreement adopted at a conference of representatives of the shaft operators and miners on April 3.

April 15—Eleven thousand miners employed by the Philadelphia & Reading Coal & Iron Co. in the Shamokin (Pa.) area of District 9, United Mine Workers, go out on strike against alleged inequalities in working time between collieries in the region.

April 17—New organization to carry on the fight against John L. Lewis, international president, United Mine

Workers, formed at a meeting called at St. Louis, Mo., by Alexander Howat, of Kansas, former president of the insurgent miners' union.

April 18—Striking Philadelphia & Reading Coal & Iron Co. miners in the Shamokin (Pa.) area of District 9, United Mine Workers, declare that they will attempt to form their own union. Union officials are unsuccessful in attempts to pacify the insurgents.

April 23—Coal producers, wholesalers, retailers, and representatives of the heating equipment manufacturers, at a meeting in Columbus, Ohio, complete a temporary organization, under the chairmanship of George K. Smith, Columbus, president, Sunday Creek Coal Co., to cooperate with the Committee of Ten—Coal and Heating Industries.

April 24—Articles of incorporation for the National Coal Credit Corporation signed after a meeting in Cincinnati preparatory to filing in Columbus, Ohio. The corporation, a non-profit organization, is to serve as a clearing house for credit information in the coal industry. Headquarters are to be established at Cincinnati.

MARKETS

in Review

LOW prices and an almost complete cessation of demand for domestic coal featured the bituminous markets of the country in April. Consumer buying was of the hand-to-mouth variety, and dealers refused to lay in stocks even with the added inducement of lower prices. Demand for industrial coal, reflecting the continued business depression, also was slow in April, but the continued curtailment in production, made necessary by the slow movement of domestic sizes, prevented any relief of the shortage of slack and screenings, with the result that prices registered a still further gain.

April proved to be a disappointing month for producers seeking contracts. The tonnage signed up varied in different markets, but price difficulties and inability to gage future requirements caused many consumers to delay closing. Such agreements as were signed carried prices ranging from 5 to 20c. lower than last year. Shipments to the lower Lake ports began early in April, but most districts found the movement disappointing in its smallness. Lake buyers preferred to hold off until there was more evidence of a possible demand.

Coal Age Index of spot bituminous prices (preliminary) was: 136, April 4, 11, and 18; and 134, April 25. Corresponding weighted average prices were: \$1.65, April 4 and 11; \$1.64, April 18; and \$1.62, April 25. Revised Index figures for March were: 141, March 7; 140, March 14 and 21, and 136, March 28. Corresponding weighted average prices were: \$1.71, March 7; \$1.69, March 14; \$1.70, March 21; and \$1.65, March 28. The monthly Index for March was 139½, against the unrevised figure of 135½ for April.

Substantial price reductions failed to stimulate the movement of domestic sizes in the anthracite markets of the country in April. Householders bought only for immediate needs, and evidenced no desire for filling their bins. Dealers added a moderate tonnage to stocks at the end of the month in anticipation of the advance of 20c. in prices scheduled for May 1. The shortage of buckwheat was aggravated by decreased running time at the mines. Pea and rice also were tight at times, though they eased at the last of the month.

BOTH domestic and industrial coal went begging in the Chicago market in April. Eastern high-volatile premium block at \$2 and egg at \$1.75 found less demand than the same sizes enjoyed five months ago at \$3.75 and \$4. Both spot and contract prices on smokeless varieties were low. Lump, egg, and stove, nominally priced at \$2.25, frequently were dumped at \$1.75, or 25c. under the regular contract price for mine-run. The latter size was in even less demand than prepared coals, largely because retailers were able to obtain lump, egg, and stove for less than they could buy mine-run. Spot prices on the size ranged from \$1.50 to \$2.

Mine-run sales labored under the handicap of a buyers' strike on the part of the retailers, who held out for a contract price of \$1.75 for May—in some cases for the coming year. Operators insisted on a quotation of \$2. The deadlock held over the greater part of April, during which less than 10 per cent of the average tonnage moved on contracts, but was broken at the last when one smokeless shipper named the \$1.75 price

for May and June. No change was made in the quotations on prepared sizes.

A market for smokeless slack was almost non-existent in Chicago in April. Contract prices dropped 15@25c. below those for the same period a year ago, while spot quotations ranged from \$1 to \$1.25.

Illinois, Indiana, and western Kentucky operators were able to obtain contracts with difficulty. Less than half the usual tonnage was signed up, buyers holding out for reductions of 5@15c. One of the leading coal-carrying railroads in Illinois decided to close down its mines and buy 1,000,000 tons of coal annually from Illinois producers. Both shaft and strip operators will participate in the business, and will have an option of furnishing either mine-run, steam lump, or egg. This move is expected to release additional screenings in the future, further depressing the market for this size.

SECONDARY grades of Illinois and Indiana screenings sold at 85c.@\$1 in April, while lump and egg went at the extremely low prices of \$2@\$2.25. Southern Illinois screenings were firm at \$1.50@\$1.75, but the principal movement was on contracts. Shipments of prepared sizes slumped, with the result that "no bills" piled up on the mine tracks. Western Kentucky producers found it difficult to obtain asking prices on contract screenings. Buyers pointed to the lows of 5 and 10c. last September and October, and insisted that the average price of around 30c. for 1930 should be quoted. Some contracts were renewed at that figure, but most producers held off in the expectation that screenings will be scarce and tight this

Current Quotations—Spot Prices, Anthracite—Net Tons, F.O.B. Mines

Market Quoted	April 4, 1931		Week Ended April 11, 1931		April 18, 1931		April 25, 1931	
	Independent	Company	Independent	Company	Independent	Company	Independent	Company
Broken.....	New York.....	\$6.50	New York.....	\$6.50	New York.....	\$6.50	New York.....	\$6.50
Broken.....	Philadelphia.....	\$6.50@6.75	Philadelphia.....	\$6.50@6.75	Philadelphia.....	\$6.50@6.75	Philadelphia.....	\$6.50@6.75
Egg.....	New York.....	6.75	New York.....	6.75	New York.....	6.75	New York.....	6.75
Egg.....	Philadelphia.....	6.75@7.00	Philadelphia.....	6.75@7.00	Philadelphia.....	6.75@7.00	Philadelphia.....	6.75@7.00
Egg.....	Chicago.....	6.75	Chicago.....	6.75	Chicago.....	6.75	Chicago.....	6.75
Stove.....	New York.....	7.00	New York.....	7.00	New York.....	7.00	New York.....	7.00
Stove.....	Philadelphia.....	7.00@7.25	Philadelphia.....	7.00@7.25	Philadelphia.....	7.00@7.25	Philadelphia.....	7.00@7.25
Stove.....	Chicago.....	7.00	Chicago.....	7.00	Chicago.....	7.00	Chicago.....	7.00
Chestnut.....	New York.....	7.00	New York.....	7.00	New York.....	7.00	New York.....	7.00
Chestnut.....	Philadelphia.....	7.00@7.25	Philadelphia.....	7.00@7.25	Philadelphia.....	7.00@7.25	Philadelphia.....	7.00@7.25
Chestnut.....	Chicago.....	7.00	Chicago.....	7.00	Chicago.....	7.00	Chicago.....	7.00
Pea.....	New York.....	4.75@5.00	New York.....	4.75@5.00	New York.....	4.75@5.00	New York.....	4.75@5.00
Pea.....	Philadelphia.....	4.75@5.00	Philadelphia.....	4.75@5.00	Philadelphia.....	4.75@5.00	Philadelphia.....	4.75@5.00
Pea.....	Chicago.....	4.75	Chicago.....	4.75	Chicago.....	4.75	Chicago.....	4.75
Buckwheat.....	New York.....	3.25@4.25	New York.....	3.25@4.50	New York.....	3.25@4.25	New York.....	3.25@4.00
Buckwheat.....	Philadelphia.....	3.25@3.50	Philadelphia.....	3.25@3.50	Philadelphia.....	3.25@3.50	Philadelphia.....	3.25@3.50
Buckwheat.....	Chicago.....	3.25@3.75	Chicago.....	3.25@3.75	Chicago.....	3.25@3.75	Chicago.....	3.25@3.75
Rice.....	New York.....	1.85	New York.....	1.85†	New York.....	1.85†	New York.....	1.85†
Rice.....	Philadelphia.....	1.85	Philadelphia.....	1.85	Philadelphia.....	1.85	Philadelphia.....	1.85
Rice.....	Chicago.....	1.85@2.35	Chicago.....	1.85@2.35	Chicago.....	1.85@2.35	Chicago.....	1.85@2.35
Barley.....	New York.....	1.00@1.25	New York.....	1.00@1.25	New York.....	1.00@1.25	New York.....	1.00@1.25
Barley.....	Philadelphia.....	1.40	Philadelphia.....	1.40	Philadelphia.....	1.40	Philadelphia.....	1.40

* Domestic buckwheat, \$3.70 (D., L. & W.).

† Stoker rice, \$1.85 (D., L. & W.).

summer. Western Kentucky lump and egg were offered freely at \$1.25@2.25.

No relief from the current depression was apparent in the St. Louis market in April. The tonnage moved compared favorably with the total in April, 1930, which, however, was a light month, but prices gave no consolation.

An advance of 25c. in the price of Kansas screenings was the only event of importance in the Southwestern market in April. Final price is now \$1.75 a ton. Most of the tonnage, however, consists of crushed mine-run. Washed Missouri screenings, also largely crushed mine-run, advanced to the same figure, although some varieties were sold at as low as \$1.25. Most of the tonnage, however, moved at \$1.65@1.75. Arkansas semi-anthracite screenings sold at \$1.50@1.75 over the month.

Dullness featured the market at the

Head of the Lakes in April, and shipments are expected to show a further decrease from the low figure of 13,859 cars in March. Prices on bituminous coals were cut at the last of the month to the following: Pocahontas lump and egg, \$7.50; stove, \$7.25; small nut, \$6.50; mine-run, \$5; slack, \$4; Kentucky block, \$6.75; egg, \$6.50; egg and stove, \$6.35; stove, \$6.25; slack, \$4; Youghiogheny block, \$5.10; lump and egg, \$4.85; stove, \$4.60; run-of-pile, \$4.25; slack, \$3.75; splint block, \$5.35; lump and egg, \$5.10; stove, \$4.85; run-of-pile, \$4.50; slack, \$3.75.

Mild weather ushered in the spring season in the Rocky Mountain district, with the result that domestic demand fell flat in April. Dealers refused to store coal, preferring to continue their hand-to-mouth buying, and production slumped materially. Prices of both

steam and domestic coals were unchanged in April.

Exceedingly low prices and absence of demand featured the Louisville market in April. Running time at Kentucky mines slumped materially as the month wore on, though a few inquiries for lake shipments held out promise for the future. Domestic sizes bore the brunt of the depression, while screenings, as a result of decreased production, a lessening in the number of contract buyers, and a rise in number of open market purchasers, enjoyed a comparatively strong demand.

Western Kentucky prepared sizes sold at \$1.15@1.40 over the most of the month, with 3x2-in. nut going at the top price. Mine-run was quoted at 85c@1.25, and screenings moved at 65@85c. Only a small tonnage of Hazard block sold at more than \$1.50, though the range of quotations was \$1.35@1.75. Lump (2-in.), egg, nut, and mine-run went at \$1.25@1.50, while screenings commanded 75c@1. Harlan block ranged from \$1.75 to \$2, with little selling at more than the lower limit. Some distress coal was moved at \$1.50. Other prices were: egg and nut, \$1.40@1.60; mine-run, \$1.30@1.60; and slack, 90c@1. Quotations on Elkhorn coals were: block, \$1.40@1.75; egg and mine-run, \$1.25@1.50; slack, 90c@1.10.

ONE of the worst price breaks in recent years came in the Cincinnati market in the latter part of April. However, the price slump and the glut of high-volatile lump and block failed to check the growing strength of steam sizes in one of the worst "contract" months in some years. High-volatile shippers failed to heed the warnings of Lake Erie shippers that little coal would be moved to the Head of the Lakes until some time in June, and consequently were forced to sacrifice large tonnages destined for the Lake trade. Considerable lump and block sold down to \$1, though egg was saved in a measure by a rising demand in the West.

Low-volatile business went through the month on an even keel. Standard shippers maintained circulars fairly well, though price cutters kept about 25c. under them on lump, egg, and stove. Mine-run lagged a bit, but not enough to cause distress, while washed nut, after finding its level at \$1.75, stayed there for the month. Demand for high-volatile slack increased, with the result that off-grades of smokeless slack benefited to such an extent that they were bringing \$1.10@1.25 at the end of the month.

April was a quiet month in the Columbus market. Cessation of domestic demand materially reduced the movement of coal through the Columbus gateways, though the steam trade counteracted the decrease to some extent by a little better than March activity. Retailers continued their efforts to clean up their yards in preparation for summer, and for that reason were loath to buy. In the steam division, practically all former agreements were renewed and

Current Quotations—Spot Prices, Bituminous Coal— Net Tons, F.O.B. Mines

LOW-VOLATILE, EASTERN	Market Quoted	Week Ended			
		April 4, 1931	April 11, 1931	April 18, 1931	April 25, 1931
Smokeless lump.....	Chicago.....	\$1.85@2.25	\$1.85@2.25	\$1.85@2.25	\$1.85@2.25
Smokeless egg.....	Chicago.....	1.85@2.25	1.85@2.25	1.85@2.25	1.85@2.25
Smokeless stove.....	Chicago.....	2.00@2.35	2.00@2.35	2.00@2.35	2.00@2.35
Smokeless nut.....	Chicago.....	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00
Smokeless pea.....	Chicago.....	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00
Smokeless mine-run.....	Chicago.....	1.50@2.00	1.50@2.00	1.50@2.00	1.50@2.00
Smokeless slack.....	Chicago.....	1.25@1.35	1.25@1.35	1.25@1.35	1.25@1.35
Smokeless lump.....	Cincinnati.....	2.00@2.25	2.00@2.25	2.00@2.25	2.00@2.25
Smokeless egg.....	Cincinnati.....	2.00@2.25	2.00@2.25	2.00@2.25	2.00@2.25
Smokeless stove.....	Cincinnati.....	2.00@2.25	2.00@2.25	2.00@2.25	2.00@2.25
Smokeless nut.....	Cincinnati.....	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00
Smokeless mine-run.....	Cincinnati.....	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00
Smokeless slack.....	Cincinnati.....	.85@1.25	1.00@1.25	1.10@1.25	1.10@1.25
*Smokeless mine-run.....	Boston.....	4.00@4.25	4.00@4.25	4.00@4.25	3.90@4.15
*Smokeless nut-and-slack.....	Boston.....	3.60@3.70	3.60@3.70	3.53@3.64	3.42@3.53
Clearfield mine-run.....	Boston.....	1.50@1.75	1.50@1.75	1.50@1.75	1.50@1.75
Clearfield mine-run.....	New York.....	1.75@2.00	1.75@2.00	1.75@2.00	1.70@1.90
Cambria mine-run.....	Boston.....	1.85@2.10	1.85@2.10	1.85@2.10	1.75@2.00
Somerset mine-run.....	Boston.....	1.65@2.00	1.65@2.00	1.65@2.00	1.60@1.90
Pool 1 (Navy Standard).....	New York.....	2.10@2.35	2.10@2.35	2.10@2.35	2.00@2.25
Pool 1 (Navy Standard).....	Philadelphia.....	2.10@2.35	2.10@2.35	2.10@2.35	2.10@2.35
Pool 9 (super low-vol.).....	New York.....	1.75@2.00	1.75@2.00	1.75@2.00	1.70@1.90
Pool 9 (super low-vol.).....	Philadelphia.....	1.75@2.00	1.75@2.00	1.75@2.00	1.75@2.00
Pool 10 (h. gr. low-vol.).....	New York.....	1.60@1.75	1.60@1.75	1.60@1.75	1.60@1.70
Pool 10 (h. gr. low-vol.).....	Philadelphia.....	1.60@1.75	1.60@1.75	1.60@1.75	1.60@1.75
Pool 11 (low-vol.).....	New York.....	1.40@1.50	1.40@1.50	1.40@1.50	1.40@1.50
Pool 11 (low-vol.).....	Philadelphia.....	1.40@1.55	1.40@1.55	1.40@1.55	1.40@1.55
HIGH-VOLATILE, EASTERN					
Pool 54-64 (gas and st.).....	New York.....	\$0.95@1.15	\$0.95@1.15	\$0.95@1.15	\$0.95@1.15
Pool 54-64 (gas and st.).....	Philadelphia.....	1.00@1.15	1.00@1.15	1.00@1.15	1.00@1.15
Pittsburgh sc'd gas.....	Pittsburgh.....	1.70@1.80	1.70@1.80	1.70@1.80	1.70@1.80
Pittsburgh steam lump.....	Pittsburgh.....	1.60@1.80	1.60@1.80	1.60@1.80	1.60@1.80
Pittsburgh egg.....	Pittsburgh.....	1.65@1.75	1.65@1.75	1.65@1.75	1.65@1.75
Pittsburgh gas mine-run.....	Pittsburgh.....	1.45@1.60	1.45@1.60	1.45@1.60	1.45@1.60
Pittsburgh steam mine-run.....	Pittsburgh.....	1.30@1.60	1.30@1.60	1.30@1.60	1.30@1.60
Pittsburgh gas slack.....	Pittsburgh.....	1.00@1.20	1.00@1.20	1.00@1.20	1.00@1.20
Pittsburgh steam slack.....	Pittsburgh.....	.65@.85	.65@.85	.70@.85	.75@.85
Connellsville coking coal.....	Pittsburgh.....	1.40@1.75	1.40@1.75	1.40@1.75	1.40@1.75
Westmoreland lump.....	Philadelphia.....	2.10@2.25	2.10@2.25	2.10@2.25	2.10@2.25
Westmoreland 1-in. lump.....	Philadelphia.....	1.80@1.90	1.80@1.90	1.80@1.90	1.80@1.90
Westmoreland egg.....	Philadelphia.....	1.65@1.75	1.65@1.75	1.65@1.75	1.65@1.75
Westmoreland mine-run.....	Philadelphia.....	1.60@1.70	1.60@1.70	1.60@1.70	1.60@1.70
Westmoreland slack.....	Philadelphia.....	1.00@1.15	1.00@1.15	1.00@1.15	1.00@1.15
Fairmont lump.....	Fairmont.....	1.10@1.50	1.10@1.50	1.15@1.60	1.15@1.60
Fairmont 1-in. lump.....	Fairmont.....	1.05@1.40	1.05@1.40	1.05@1.35	1.05@1.35
Fairmont egg.....	Fairmont.....	1.10@1.60	1.10@1.60	1.10@1.40	1.10@1.40
Fairmont mine-run.....	Fairmont.....	.90@1.10	.90@1.10	1.00@1.20	1.00@1.20
Fairmont slack.....	Fairmont.....	.60@.90	.60@.90	.70@.95	.70@1.00
Kanawha lump.....	Cincinnati.....	1.50@1.75	1.50@2.00	1.35@2.00	1.35@2.00
Kanawha egg.....	Cincinnati.....	1.25@1.65	1.25@1.60	1.25@1.50	1.25@1.60
Kanawha mine-run (gas).....	Cincinnati.....	1.40@1.60	1.40@1.65	1.40@1.60	1.40@1.60
Kanawha mine-run (st.).....	Cincinnati.....	1.10@1.35	1.10@1.35	1.10@1.35	1.10@1.35
Kanawha nut-and-slack.....	Cincinnati.....	.75@1.10	.85@1.10	.85@1.10	.85@1.10
Williamson (W. Va.) lump.....	Cincinnati.....	1.50@2.00	1.50@2.00	1.50@2.00	1.50@2.00
Williamson (W. Va.) egg.....	Cincinnati.....	1.25@1.60	1.25@1.50	1.25@1.50	1.25@1.50
Williamson (W. Va.) mine-run (gas).....	Cincinnati.....	1.35@1.50	1.40@1.60	1.40@1.65	1.40@1.65
Williamson (W. Va.) mine-run (st.).....	Cincinnati.....	1.10@1.35	1.10@1.35	1.00@1.40	1.00@1.40
Williamson (W. Va.) nut-and-slack.....	Cincinnati.....	.85@1.00	.85@1.10	.85@1.10	.85@1.25
Logan (W. Va.) lump.....	Cincinnati.....	1.35@1.75	1.35@1.65	1.25@1.60	1.25@1.65
Logan (W. Va.) egg.....	Cincinnati.....	1.25@1.60	1.25@1.50	1.25@1.50	1.25@1.50
Logan (W. Va.) mine-run.....	Cincinnati.....	1.10@1.40	1.10@1.35	1.10@1.35	1.10@1.35
Logan (W. Va.) nut-and-slack.....	Cincinnati.....	.75@1.00	.75@1.00	.85@1.00	.85@1.10
Logan (W. Va.) slack.....	Cincinnati.....	.75@.85	.75@1.00	.75@1.00	.85@1.10
Hocking (Ohio) lump.....	Columbus.....	1.75@1.85	1.75@1.85	1.75@1.85	1.70@1.80
Hocking (Ohio) egg.....	Columbus.....	1.55@1.65	1.55@1.65	1.55@1.65	1.55@1.65
Hocking (Ohio) mine-run.....	Columbus.....	.75@.90	.75@.90	.75@.90	.85@1.00
Hocking (Ohio) nut-and-slack.....	Columbus.....	1.50	1.50	1.50	1.50
Pitts. No. 8 (Ohio) lump.....	Cleveland.....	1.15@1.30	1.15@1.30	1.15@1.30	1.15@1.30
Pitts. No. 8 (Ohio) 1-in. lump.....	Cleveland.....	1.20@1.35	1.20@1.35	1.20@1.35	1.20@1.35
Pitts. No. 8 (Ohio) egg.....	Cleveland.....	1.10@1.15	1.10@1.15	1.10@1.15	1.10@1.15
Pitts. No. 8 (Ohio) mine-run.....	Cleveland.....	.75@.85	.75@.85	.75@.85	.75@.85

* Gross tons, f.o.b. vessels, Hampton Roads.

some new contracts were reported. Prices were 5@10c. lower than in 1930.

For the second consecutive month, screenings were advanced 10c. in the Cleveland market in April. At the same time, however, lump proved to be a drug on the market, and dropped to \$1.50. Manufacturing plants and railroads continued their program of buying only for immediate needs, while takings by steel companies were only moderate.

With the end of the heating season on April 1, domestic demand almost disappeared in the Pittsburgh market. Some shading of the top prices on lump was noticeable as the month wore on, and ultimately resulted in a softening of the egg market, though the price range of the latter did not change materially. Decreased production, however, reduced the available supply of slack, and prices on this size held firm over the month.

Warm weather and a falling off in industrial orders made April a slow month in northern West Virginia. Competition continued to be keen, with some price-cutting. Quotations were low for all sizes, particularly domestic, with little prospect of an increase until the Lake trade gets under way.

Quietness continued to pervade the central Pennsylvania market in April. Buyers were sparing in their orders, though screenings enjoyed a comparatively good demand. Prices declined slightly as the month wore on, to the following: Pool 1, \$2.05@2.35; Pool 71, \$1.75@2.10; Pool 9, \$1.70@2; Pool 10, \$1.50@1.70.

Extreme dullness featured the New England market in April. Prices eased off considerably, proposals to supply public institutions disclosing new low levels. No. 1 Navy Standard smokeless mine-run sold at \$4@4.20, f.o.b. vessels, Hampton Roads, at the end of the month, while nut-and-slack went at \$3.42@3.53, a reduction of 10@20c. Movement of all-rail coals from central Pennsylvania was light and prices were soft.

tonnage signed up was disappointing.

Slight gains in the movement of domestic coal were registered in the Birmingham market in April, stimulated in part by anticipation of price advances of 10@20c. on May 1. Aside from slight reductions in one or two varieties, April prices were unchanged from March. The market for steam coal, contrary to that for domestic sizes, slumped in April. High-grade Cahaba and Black Creek screenings, largely used for bunkering, were affected most. Medium-quality screenings enjoyed a comparatively favorable position as a result of curtailed production. Three railroads signed contracts for the next year. Spot quotations on steam coal were unchanged from March levels.

In spite of substantial price reductions, domestic sizes of anthracite failed to show much activity in the New York market until after April 20. Dealers moved a normal tonnage on small end-

of-the-season orders, but bin-filling business got under way slowly. During the greater part of the month, purchases were confined to approximately the tonnages currently delivered to householders. Moderate additions were made to stocks just prior to the May 1 advance of 20c. The buckwheat shortage was aggravated in April by decreased running time at the mines due to local strikes, holidays, and the deficiencies of the domestic trade. Pea and rice also were short at times, though they eased at the last of the month.

Spring reductions in force in April failed to stimulate demand for domestic sizes of anthracite in Philadelphia. Householders refused to consider filling their bins, and considerable variation in retail prices further disturbed buying. Such coal as was sold moved only for current consumption, and the total tonnage was still further depressed by mild weather.

Current Quotations—Spot Prices, Bituminous Coal— Net Tons, F.O.B. Mines

MIDDLE WEST	Market Quoted	Week Ended			
		April 4, 1931	April 11, 1931	April 18, 1931	April 25, 1931
Franklin (Ill.) lump.....	Chicago.....	\$2.25	\$2.25	\$2.25	\$2.25
Franklin (Ill.) egg.....	Chicago.....	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50	2.25@ 2.50
Franklin (Ill.) mine-run.....	Chicago.....	2.15	2.15	2.15	2.15
Franklin (Ill.) screenings.....	Chicago.....	1.65@ 1.75	1.65@ 1.75	1.65@ 1.75	1.50@ 1.75
Central Ill. lump.....	Chicago.....	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90
Central Ill. egg.....	Chicago.....	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90	1.75@ 1.90
Central Ill. mine-run.....	Chicago.....	1.70@ 1.80	1.70@ 1.80	1.70@ 1.80	1.70@ 1.80
Central Ill. screenings.....	Chicago.....	1.00@ 1.25	1.00@ 1.25	1.00@ 1.25	80@ 1.25
Ind. 4th Vein lump.....	Chicago.....	2.10@ 2.50	2.10@ 2.50	2.10@ 2.50	2.10@ 2.50
Ind. 4th Vein egg.....	Chicago.....	2.00@ 2.50	2.00@ 2.50	2.00@ 2.50	2.00@ 2.50
Ind. 4th Vein mine-run.....	Chicago.....	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Ind. 4th Vein screenings.....	Chicago.....	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Ind. 5th Vein lump.....	Chicago.....	2.00@ 2.10	2.00@ 2.10	2.00@ 2.10	2.00@ 2.10
Ind. 5th Vein egg.....	Chicago.....	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Ind. 5th Vein mine-run.....	Chicago.....	1.21@ 1.75	1.21@ 1.75	1.21@ 1.75	1.21@ 1.75
Ind. 5th Vein screenings.....	Chicago.....	.85@ 1.25	.85@ 1.25	.85@ 1.25	.85@ 1.25
Mt. Olive (Ill.) lump.....	St. Louis.....	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Mt. Olive (Ill.) egg.....	St. Louis.....	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60
Mt. Olive (Ill.) mine-run.....	St. Louis.....	1.40@ 1.50	1.40@ 1.50	1.40@ 1.50	1.40@ 1.50
Mt. Olive (Ill.) screenings.....	St. Louis.....	.85@ 1.10	.85@ 1.20	.90@ 1.25	.90@ 1.25
Standard (Ill.) lump.....	St. Louis.....	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60
Standard (Ill.) egg.....	St. Louis.....	1.40@ 1.60	1.40@ 1.60	1.40@ 1.60	1.40@ 1.60
Standard (Ill.) mine-run.....	St. Louis.....	1.25@ 1.40	1.25@ 1.40	1.25@ 1.40	1.25@ 1.40
Standard (Ill.) screenings.....	St. Louis.....	.75@ .85	.75@ .95	.80@ 1.00	.80@ 1.00
West Ky. lump.....	Louisville.....	1.40@ 1.75	1.40@ 1.75	1.40@ 1.75	1.15@ 1.40
West Ky. egg.....	Louisville.....	1.40@ 1.75	1.40@ 1.75	1.40@ 1.75	1.15@ 1.40
West Ky. nut.....	Louisville.....	1.15@ 1.50	1.15@ 1.50	1.15@ 1.50	1.15@ 1.40
West Ky. mine-run.....	Louisville.....	.90@ 1.25	.90@ 1.25	.90@ 1.25	.85@ 1.25
West Ky. screenings.....	Louisville.....	.75@ .90	.75@ .85	.75@ .85	.65@ .85
West Ky. lump.....	Chicago.....	1.35	1.25@ 1.35	1.25@ 1.35	1.25@ 1.35
West Ky. egg.....	Chicago.....	1.35	1.25@ 1.35	1.25@ 1.35	1.25@ 1.35
West Ky. screenings.....	Chicago.....	.70@ .80	.70@ .80	.70@ .80	.65@ .85

SOUTH AND SOUTHWEST

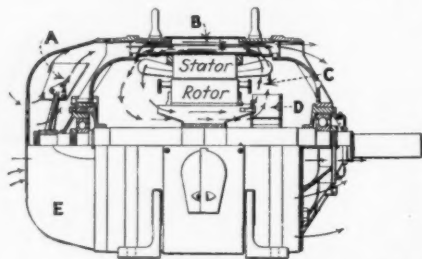
		\$1.60	\$1.60	\$1.60	\$1.60
Big Seam lump.....	Birmingham.....	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75	1.60@ 1.75
Big Seam mine-run.....	Birmingham.....	1.50@ 2.00	1.50@ 2.00	1.50@ 2.00	1.50@ 2.00
Harlan (Ky.) block.....	Chicago.....	1.25@ 1.75	1.25@ 1.75	1.25@ 1.75	1.25@ 1.75
Harlan (Ky.) egg.....	Chicago.....	1.00@ 1.10	1.00@ 1.10	1.00@ 1.10	1.00@ 1.10
Harlan (Ky.) slack.....	Chicago.....	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Harlan (Ky.) block.....	Louisville.....	1.40@ 1.60	1.40@ 1.60	1.40@ 1.60	1.40@ 1.60
Harlan (Ky.) egg.....	Louisville.....	1.30@ 1.60	1.30@ 1.60	1.30@ 1.60	1.30@ 1.60
Harlan (Ky.) mine-run.....	Louisville.....	.85@ 1.10	.90@ 1.10	.90@ 1.10	.90@ 1.10
Harlan (Ky.) nut-and-slack.....	Louisville.....	1.35@ 2.25	1.35@ 2.25	1.35@ 2.25	1.35@ 2.25
Harlan (Ky.) block.....	Cincinnati.....	1.25@ 1.75	1.25@ 1.75	1.25@ 1.75	1.25@ 1.75
Harlan (Ky.) egg.....	Cincinnati.....	1.10@ 1.60	1.10@ 1.60	1.10@ 1.60	1.10@ 1.60
Harlan (Ky.) mine-run.....	Cincinnati.....	.85@ 1.10	1.00@ 1.25	1.00@ 1.25	1.00@ 1.25
Harlan (Ky.) nut-and-slack.....	Cincinnati.....	1.50@ 2.00	1.50@ 2.00	1.50@ 2.00	1.50@ 2.00
Hazard (Ky.) block.....	Chicago.....	1.25@ 1.75	1.25@ 1.75	1.25@ 1.75	1.25@ 1.75
Hazard (Ky.) egg.....	Chicago.....	1.00@ 1.10	1.00@ 1.10	1.00@ 1.10	1.00@ 1.10
Hazard (Ky.) slack.....	Chicago.....	1.40@ 1.75	1.40@ 1.75	1.40@ 1.75	1.25@ 1.75
Hazard (Ky.) block.....	Louisville.....	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Hazard (Ky.) egg.....	Louisville.....	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Hazard (Ky.) mine-run.....	Louisville.....	.75@ 1.00	.75@ 1.00	.75@ 1.00	.75@ 1.00
Hazard (Ky.) nut-and-slack.....	Louisville.....	1.35@ 1.75	1.25@ 1.75	1.25@ 1.75	1.00@ 1.75
Hazard (Ky.) block.....	Cincinnati.....	1.25@ 1.60	1.25@ 1.60	1.10@ 1.60	1.00@ 1.50
Hazard (Ky.) egg.....	Cincinnati.....	1.10@ 1.35	1.10@ 1.35	1.10@ 1.35	1.00@ 1.35
Hazard (Ky.) mine-run.....	Cincinnati.....	.75@ 1.00	.75@ 1.00	.75@ 1.10	.85@ 1.15
Hazard (Ky.) nut-and-slack.....	Cincinnati.....	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00	1.75@ 2.00
Elkhorn (Ky.) block.....	Chicago.....	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60	1.50@ 1.60
Elkhorn (Ky.) egg.....	Chicago.....	1.00@ 1.25	1.00@ 1.25	1.00@ 1.25	1.00@ 1.25
Elkhorn (Ky.) slack.....	Chicago.....	1.50@ 1.75	1.50@ 1.75	1.50@ 1.75	1.40@ 1.75
Elkhorn (Ky.) block.....	Louisville.....	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Elkhorn (Ky.) egg.....	Louisville.....	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50	1.25@ 1.50
Elkhorn (Ky.) mine-run.....	Louisville.....	.85@ 1.10	.90@ 1.10	.90@ 1.10	.90@ 1.10
Elkhorn (Ky.) nut-and-slack.....	Louisville.....	1.50@ 2.50	1.50@ 2.50	1.35@ 2.50	1.35@ 2.50
Elkhorn (Ky.) block.....	Cincinnati.....	1.35@ 1.75	1.35@ 1.75	1.25@ 1.75	1.25@ 1.75
Elkhorn (Ky.) egg.....	Cincinnati.....	1.10@ 1.50	1.10@ 1.60	1.10@ 1.60	1.10@ 1.60
Elkhorn (Ky.) mine-run.....	Cincinnati.....	.85@ 1.00	.85@ 1.10	.85@ 1.10	.85@ 1.25
Elkhorn (Ky.) nut-and-slack.....	Cincinnati.....	3.00@ 3.50	2.00@ 3.25	3.00@ 3.25	3.00@ 3.25
Kansas shaft lump.....	Kansas City.....	2.25	2.25	2.25	2.25
Kansas strip lump.....	Kansas City.....	2.00	2.00@ 2.10	2.00@ 2.10	2.00@ 2.10
Kansas mine-run.....	Kansas City.....	1.50	1.75	1.75	1.75
Kansas screenings.....	Kansas City.....				

WHAT'S NEW IN COAL-MINING EQUIPMENT



Mossay Principle Cools Inclosed Motors

Reliance Electric & Engineering Co., Cleveland, Ohio, has brought out a line of fully inclosed, fan-cooled, induction motors from 20 hp. at 1,200 r.p.m. and up. The Mossay principle of cooling is employed for the larger sizes, the company says, because the design of the smaller motors does not provide sufficient cooling area. Extra area for this



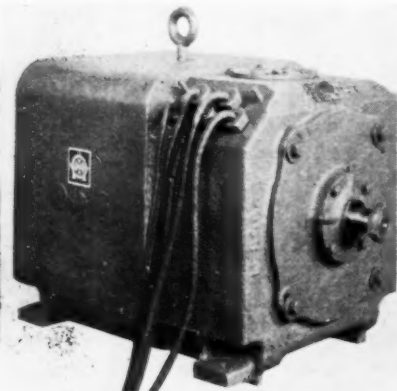
Reliance Totally Inclosed, Fan-Cooled Induction Motor

A—External fan which blows cooling air over stator and tubes. B—Tubes for cooling confined warm air; external cooling air. C—Internal circulation carrying heated air through cooling tubes. D—Internal fan. E—Fan guard.

purpose is obtained by the use of tubes extending over the outside of the rotor.

A single internal fan on the rotor circulates the confined warm air through the tubes, over which are blown blasts of cool outside air from the one end of the motor to the other. Using this method of cooling for the large sizes makes it possible, according to the manufacturer, to furnish fully inclosed, fan-cooled motors which are interchangeable in mounting dimensions

Reliance Explosion-Proof Motor for Coal-Mining Machinery



with standard open motors of the same horsepower and speed rating in all sizes from the smallest to the largest (150 hp.)

The Reliance company also has developed an explosion-proof motor for use with coal-mining machinery operated by direct current. The motor is so constructed, it is declared, that even if an explosive mixture of gas and air should gain access to the case, ignite, and explode, the case will withstand the explosion and not communicate sparks or flames to the outer air. These motors are built in sizes required for driving coal loaders, coal cutters, and other coal-mining machinery.

Correcting the Record

Through error, it was stated in the description of the new "Tiger-Weld" power bonds of the American Steel & Wire Co., Chicago (*Coal Age*, April, 1931, p. 218), that only one type, the BF-3, was offered for use in the mining industries. This is incorrect, as the company makes three types of the new bonds for this service. "Tiger-Weld" power bonds are constructed with solid steel terminals flash-butt-welded to the copper conductor, thus, according to the company, maintaining the full cross-section of the conductor and eliminating "crushing" or "necking-down" of the wires or abrupt deformations which might tend to induce concentration of vibratory stresses.

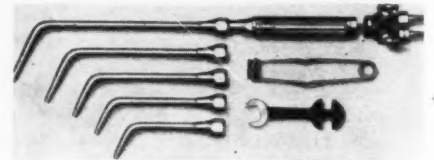
Swing-Hammer Crushers for Two-Stage Reduction

Stedman's Foundry & Machine Works, Aurora, Ill., has brought out a line of swing- and ring-hammer crushers, grinders, pulverizers, and shredders, consisting of three types and 25 sizes from 5 to 250 hp. Type "A" is a general-purpose mill, the company says, and is manufactured in nine sizes for fine and semi-fine grinding and pulverizing. Type "B" machines are used for preliminary or secondary crushing. This mill is made in sixteen sizes, ranging from 15 to 250 hp. The larger sizes, the company says, will handle 18- to 24-in. cubes of material, crushing it to $\frac{3}{4}$ in. in one reduction, and find greatest application in reducing mine-run coal to stoker and coking size. Type

"B" machines can be furnished with either swing or ring hammers, the latter for use in crushing coal or abrasive materials. Special Type "B" machines, known as the "NIFE-less hog," can be supplied for hogging wood refuse for boiler fuel, and for reducing similar materials.

Welding Process Developed

A new method of oxyacetylene welding, known as the "Lindeweld" process, has been developed by the Linde Air Products Co., New York City. It is primarily designed, the company says, for welding pipe, but can be applied in industrial welding operations. Time required for welding is cut considerably with the new system, it is said, and the oxygen and acetylene consumption are materially reduced. Consistently higher strength of welds also is claimed, as well as good ductility under bending stresses. The process, according to the company, depends essentially upon a

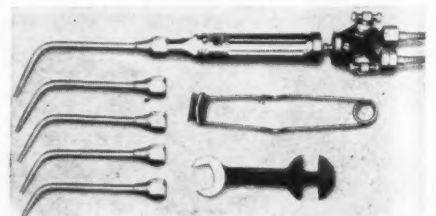


Type W-105 Welding Blowpipe

new method of blowpipe manipulation, and upon the use of the new Oxweld No. 24 "Lindeweld" process welding rod. Student welders, it is declared, can easily learn to use the new process.

Two new welding blowpipes also have been added to the Prest-O-Weld line of medium pressure apparatus. These blowpipes have a detachable valve body, to which the handle is secured by a simple locking device, which enables the operative to change from standard to different handles without detaching hose or hose connections or using a wrench. Both blowpipes are designed for use with new, one-piece, hard-drawn copper welding tips. Head angle is regularly 50 deg.

Type W-106 Welding Blowpipe



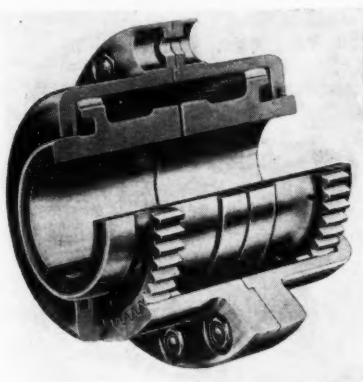
What's NEW in Coal-Mining Equipment

though this may be changed by the user if desired.

Ten different sizes of tips are available with the Type W-105 blowpipe, which is regularly furnished with five tips and a stem adapter. The W-105 equipment is designed, the company says, for all welding from the lightest sheet metal to the heaviest type of work. Type W-106 blowpipe is similar to W-105, but is smaller. It is supplied with five sizes of tips. A stem adapter is available. W-106 equipment is recommended by the company for general light welding, bronze-welding small parts, and soldering.

Flexible Coupling Developed

The Poole Engineering & Machine Co., Baltimore, Md., has added a medium-duty type to its line of flexible couplings. According to the company, the new coupling is the same in general construction as the other members of the line, but is manufactured to sell at a lower price.



Poole Medium-Duty Flexible Coupling

The coupling, it is said, adjusts itself to all conditions, leaving its members free to float without strain on bearings, shafts, or other parts. It is further asserted that the equipment will compensate efficiently for angular, as well as offset, misalignment. It may be obtained with either countersunk or through bolts, and the company recommends it for use with pumps, fans, small compressors and generators, blowers, conveyors, elevators, and other types of light- or medium-duty machinery.

Shovel and Dragline Diesel-Equipped

The Bucyrus-Erie Co., South Milwaukee, Wis., offers a new Diesel-powered, shovel, dragline, clamshell, or crane which is declared to be the fastest 24-yd. Diesel machine ever built. It is designated as 52-B. For dragline use, the company says that the extra long and extra wide caterpillar mountings give a greatly increased bearing surface on the ground. Complete steering control from the operative's

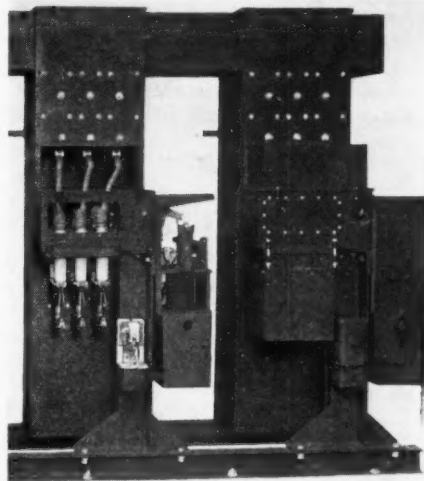


Bucyrus-Erie 52-B Dragline

position and independent propulsion, it is said, permit swinging, hoisting, and moving at the same time, increasing the mobility of the machine.

Metal-Clad Switchgear Made in Units

The Delta-Star Electric Co., Chicago, has developed a new line of unit-type, metal-clad switchgears for controlling station auxiliaries. In each steel-clad section, according to the company, is mounted a T.P.S.T., solenoid, motor-operated, oil circuit breaker, with three auxiliary switches and control relay.



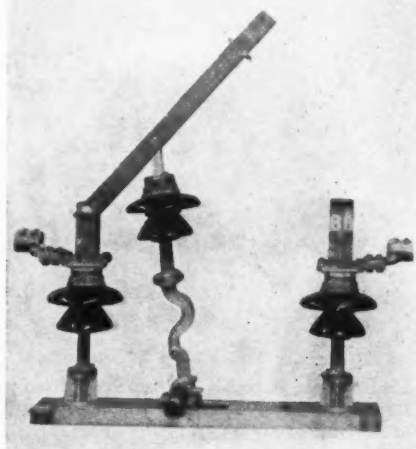
Two-Unit Assembly, Metal-Clad Switchgear

Two sets of three-pole, gang-operated disconnects with barriers between phases and between ground are simultaneously operated, so that both close or open at the same time, the company says. Interlocks between the oil breaker and the disconnects, it is asserted, prevent the latter from opening when the oil circuit breaker is closed. Current transformers, overload relays with calibrating terminals, insulated busbars, and wiring are all mounted in the steel structure. As many units as are desired can be mounted alongside each other, the company says.

The Delta-Star company also announces a new line of three-conductor "Terminators" for either compound or oil filling. These devices, it is stated, are vacuum-tight and will withstand a

hot-oil pressure of 50 lb. per square inch with the oil at 180 deg. F. The main body is made of aluminum alloy, said to have high density and strength. Molded insulation mechanically stronger than porcelain is used in the top element, the company says, to give high electrical strength. Small-diameter insulating sections and terminals allow neat taping jobs to be done if desired, according to the company. "Terminators" are made for voltages up to and including 7,500, and for amperages up to 500.

The Delta-Star company also offers a new line of gang-operated, outdoor, disconnecting switches of the push-rod

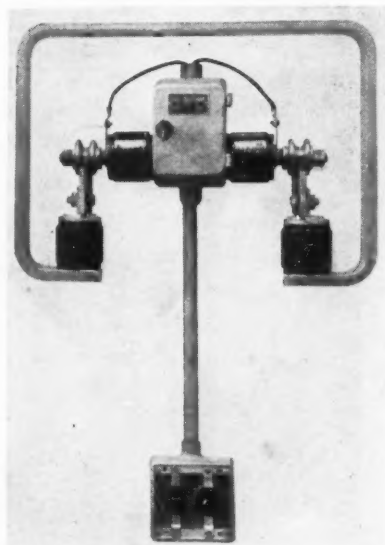


Delta-Star, Single-Pole, 25 Kv., 1,200 Amp., Gang-Operated, Outdoor Disconnect Switch

type. Multisection contacts are of the full-floating type, it is claimed, and an insulator, controlled by the operating pipe connecting all three elements, is pivoted to the double-section blade. Conductor terminal lugs are of the four-bolt-and-clamp type for use with various forms of conductors and buses.

The Delta-Star company now offers a new testing device for use with port-

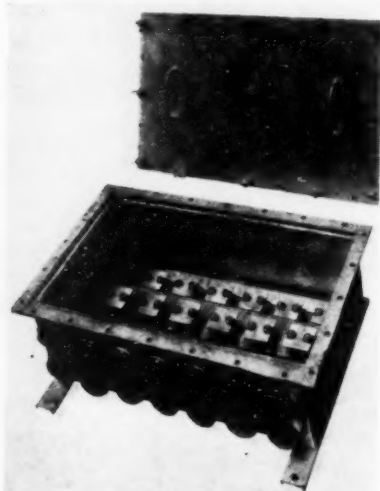
Testing Device for Portable Equipment



What's NEW in Coal-Mining Equipment

able equipment. It consists of a trolley collector with a supporting bracket and rail insulators. The bracket can be fastened to ceilings, beams, or similar construction. Current from the trolley bars passes through the collector wheels and leads to inclosed fuses and attachment plugs connected in series. This design permits an ammeter to be plugged in while testing.

Delta-Star company now offers a line of low-voltage, underground cable boxes,

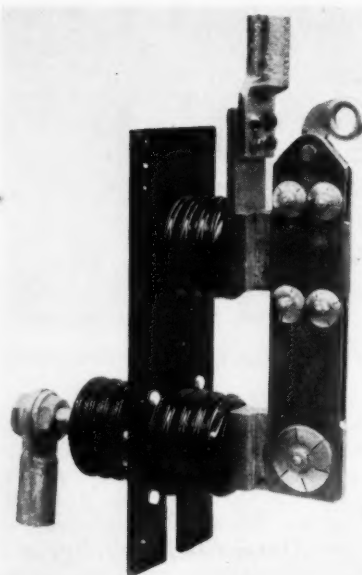
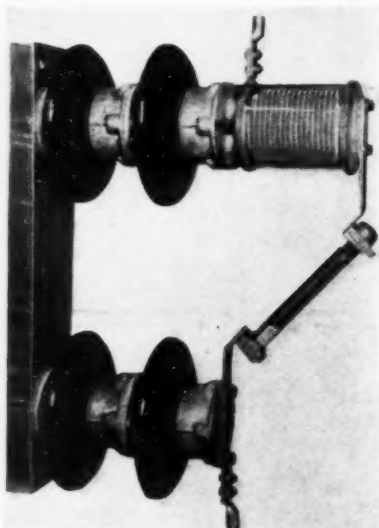


Underground Cable Box, Providing for Paralleling Six 1,000,000-Circ.Mil Cables; One 300,000-Circ.Mil Cable Tap

using Type "PB" "Terminators" with mechanical entrances for use with lead cables. The boxes are equipped with disconnecting links and fuses.

A new line of single-pole, 15-amp., high-voltage, outdoor fuse units for service transformer protection has been developed by the Delta-Star company. The limiting resistance, in series with the fuse contact, is inclosed in a heavy glass container and is mounted on the upper insulator unit. This construction permits mounting of the fuse at an angle which facilitates inspection or replacement.

Outdoor Fuse Mounting, 15 Kv.

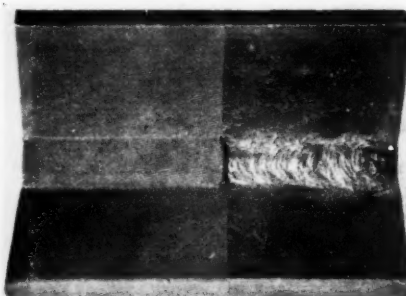


Delta-Star, 7.5 Kv., Single-Pole, Indoor, Disconnect Switch

Another development of the company is the high-capacity, front-and-back-connected, indoor-type, 7.5-kv., single-pole, disconnecting switch with double-tongue-type blades and safety locks. According to the company, the back-connected insulator unit is clamped to the steel base, permitting easy removal and replacement, and the base is slotted to reduce eddy currents caused by a heavy current flow through the conductor stud.

Putty Covers Weld Beads

"Weldite Fillet Putty" has been developed by the Fusion Welding Corporation, Chicago, for the purpose of covering welds to give them a smooth and finished appearance and remove some of the prejudice against welding.



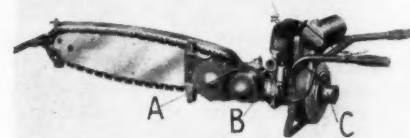
Before and After Applying "Weldite Fillet Putty"

The material, the company declares, is easily applied to weld beads in any type of joint in any position. It is furnished in powder form and is mixed with water to form a mixture of any desired consistency from a paste for application with a putty knife or any other smooth instrument to a semi-liquid which may be brushed on. After

a short time, the company states, the material becomes substantially as hard as iron. It will adhere tenaciously, it is said, and cannot be loosened by shock or vibration.

New Portable Timber Saw Has Gasoline Engine

Reed-Prentice Corporation, Worcester, Mass., offers the new Wolf portable timber saw, equipped with a 4-hp. air-cooled gasoline engine. The engine is of the single-cylinder, two-cycle type, equipped with a Bosch magneto and gasoline tank holding 2 qt. of gasoline and oil. In order to stop and start the chain independently of the engine, a multiple disk clutch is



A—Clutch; B—Swivel for Vertical or Horizontal Cutting; C—Pulley for Starting With Rope

furnished. Also, when the saw starts to stall, the clutch will slip, thus eliminating engine stoppage. According to the company, the saw is equipped with a swivel movement, so that cutting may be done either vertically or horizontally with the engine in an upright position.

Portable Vulcanizer Offered

James C. Heintz & Co., Cleveland, Ohio, have developed a portable vulcanizer for repairing and splicing rubber belts. Injuries to belts up to 60 in. in width may be repaired in the field and permanently vulcanized with this equipment in the same manner and with the same methods as are used in the factory, the company asserts. Also, it is said, splices up to 21 in. in width may be made with ease. Vulcanizers for other sizes may be obtained on special order. The vulcanizer is electrically heated and is equipped with automatic temperature control. Repairs are made under a pressure of 100 lb. per sq.in.

Portable Electric Vulcanizer

